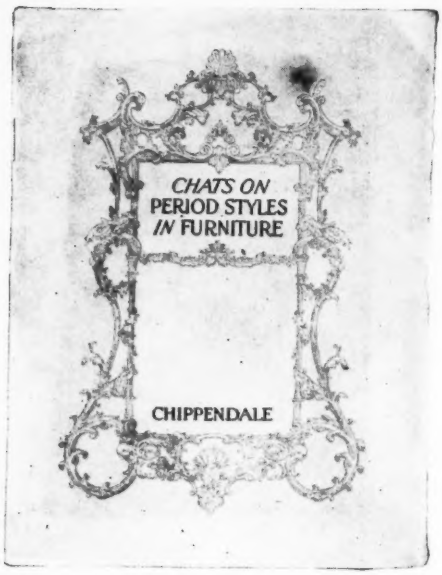
JUL 19 1924

The INDUSTRIAL-ARTS MAGAZINE

AUGUST-1924

THE·BRUCE·PUBLISHING·COMPANY
MILWAUKEE — WISCONSIN



"Chats on Period Styles in Furniture"

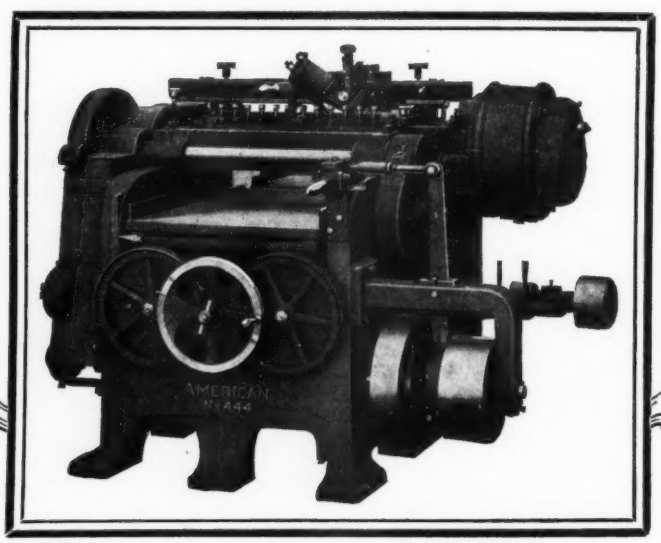
is the title of a series of booklets to be issued by the American Wood Working Machinery Company for the benefit of teachers of cabinet making in the schools.

The first issue is out and pertains to Chippendale. The others will follow in turn and will be announced later as they are issued.

Teachers of woodworking will find this series of great interest to their pupils and valuable in their class work.

The first issue "Chippendale" is limited to 6000 copies. Teachers desiring copies for themselves and their pupils should send their request in early.

AMERICAN WOOD WORKING MACHINERY COMPANY
Educational Department,
Rochester, N. Y.



INDUSTRIAL-ARTS MAGAZINE

Volume XIII AUGUST, 1924 No. 8

Manual Arts as an Integral Part of the General Education Program in the Junior High School

C. E. Phillips, University of Illinois.

The junior high school came into being in response to an intelligent demand for courses of study and school activities adapted to the physical and psychological characteristics which mark the adolescent period and the rapid changes which take place during that period. The adolescent child is an explorer in a big and fascinating world. His environment is teeming with objects, activities, institutions which stimulate his interests and curiosity to extreme limits. In a few brief years he passes beyond the imaginary play-world of childhood and into a world in which he finds himself increasingly responsive to the affairs of adult life. Before adolescence he took for granted the things that made up his environment. With rapid physical growth in the adolescent period comes mental growth and an acute interest in things seen, heard, handled and felt. The "why" and "how" of things become paramount in his interest, his passionate desire to make his own the whole range of adult experiences.

Wise recognition of these characteristics by educators has led to the setting aside of the more formal elements in the school program and the substitution of an enriched curriculum representative of the elements in the child's environment that so constantly and vividly challenge his growing interests. We now endeavor to capitalize the adolescent instinct to explore by providing abundant opportunity to explore. In all school work a large percentage of conventional content matter is quickly forgotten, and the effective values of the educative process inhere in the stock of habits formed in the acquisition of content matter, in the discovery of the child of his powers, and the fitting him out with an equipment of right habits that enable him to use his powers effectively.

The junior high school is vastly more than that zone in the curriculum once given over to the seventh, eighth and ninth grades. It is an attempt to capitalize the natural tendencies of this period of growth by giving in orderly form material to gratify eager interests, to build on rapidly developing social instincts by encouragement of right social activities, to promote the process of self-discovery by making available a variety of activities adapted from the world of industry and adult affairs. In this attempt handwork of any sort will make a strong appeal to the adolescent boy or girl.

At one time and another the manual arts function in education has been buffeted about by many winds of pedagogical doctrine, and much confusion has resulted in the minds of those engaged in this field of endeavor. Numerous aims and objectives have been set up and striven for during the past two decades, and educational fads have found their brief and disconcerting day in the sun in the extreme emphasis they placed on one and another of the purposes set up in the manual arts. We have attempted vocational and prevocational work, we have tried to organize our shops on a factory or production basis, we have aspired to develop vocational skills, adult appreciations. And a calm appraisal of results reveals practically universal failure to attain any of these desirable ends. The better understanding of adolescent psychology and the development of the junior high school idea has helped to clarify the legitimate field of manual arts. The setting up of Smith-Hughes vocational work in our schools has taken nothing away from the legitimate function of manual arts but has left a better understanding of the possibilities of manual arts. And it is interesting to see thoughtful manual arts men today swinging back to the pedagogical precepts of Dr. Woodward in his recognition of the broadly cultural values and possibilities of the manual arts, or what he preferred more aptly to denominate "manual culture." I may safely assert today without fear of being charged with educational heresy that the legitimate field of manual arts is general education, not vocational, and that it is abundantly justified on this basis and needs no other justification.

We live in a world of devices, mechanical, electrical, chemical, and physical. The average home of today employs as a matter of course the wonderful discoveries of yesterday. The progress of scientific discovery is seen in materials utilized in the construction of the house and the methods employed in their assembly, in the heating, ventilating, lighting, sanitary and other appliances. Outside the home a multitude of mechanisms minister to our needs of communication, trans-

portation, the handling of raw materials and their conversion to human use. Amazing discoveries and developments of the past two score years are part and parcel of everyday usage in our lives. So extensive is the array of mechanisms that make up the list of necessary tools we employ in living that increasingly we need as a part of the individual's general training for effective and efficient living an organized and orderly process of training in their use and the development of appreciation of their possibilities. Manual arts finds its legitimate function in thus assisting the boy to adapt himself to his mechanical environment. He lives in a house that has glass windows, doorbells, electrical fixtures and appliances, heating devices, and plumbing systems. He sees many of the crafts and trades made use of in the installation of these devices, in their use, care, maintenance and repair. In the reasonable program of manual arts he is taught to set a pane of glass, to wire a door bell, to repair a leaky faucet, to apply a floor varnish, to paint a garage; so that, in the words of an educational spellbinder, "thereafter the sight of a window, a doorbell, a faucet, a paint brush, is a challenge to an awakened instinct" to care for his own property, to use newly discovered mechanical aptitudes and abilities in constructive work and in the use and control of mechanical devices and equipment. We give a place in our social studies to instruction in thrift, in the wise use, expenditure and investment of money; we include instruction in hygiene in the laws and habits of health; we teach sanitation in home and community. On similar and equally valid grounds we may justify manual arts instruction calculated to promote individual resourcefulness, independence and general efficiency in performing many mechanical operations in a world of mechanism, to cultivate appreciation of materials, their sources, uses, and conversion to commercial ends; to stimulate observation of agencies of transportation, communication and the processes of industry. Dealing with boys instinct with the urge to imitate adult employments, we borrow from home, trades and industries an extensive array of mechanical operations which enter into the upkeep and repair of appliances in the home, about the automobile and other mechanisms that form part of common daily use. Under the name of manual arts we teach reasonably accurate use of tools in doing useful work, we give guiding suggestions and instructions and impart enthusiasm and confidence to boys doing worth while things. In the process we may discover to them the dignity and pleasure of constructive work, and some appreciation of productive processes and of economic consumption. This program is easy and natural and makes use of materials, appliances and opportunity that lie ready to our hands in every home in the land, in village, town and city. Training of this kind is not vocational or necessarily prevocational any more than is any common sense training for efficient living. It is but a single element in the complex mosaic of general training that constitutes the educational background of the intelligent worker in any field of human endeavor.

Suggestions such as I have sketched above would be beside the mark if they were not accompanied by a tangible, usable program of work; and this is what I shall endeavor to do by giving examples of where just such a conception of manual arts is being incorporated into carefully formulated courses of study. Within the month I have received from the director of industrial arts in Cincinnati, Ohio, a newly published course of study in industrial arts.[1] In his introduction he emphasizes the keeping in mind of the purposes of education. He says, among other things: "We must always teach so that our boys shall acquire useful knowledge, useful habits, high ideals and a keen appreciation of accomplishment and the general fitness of things. Since these things can be acquired only through the medium of self activity, then that is the best method which provides the best opportunity for self activity. The best method of training men to think is to place them in real situations which challenge their abilities and make thinking necessary. The same principle holds true in the training of boys. * * * (Actual demonstration of mechanical procedures for the purpose of teaching lose their value in so far as the *teacher* does the planning and thinking. * * * We have no right to expect our pupils to discover or invent the best methods of handling tools or the best industrial practices. These have been developed through the experiences of the race and their explanation and demonstration, through printed matter or pictures should be easily available whenever wanted.")

His course of study is the work of committees of teachers representing the grades in which manual-arts work is done in the schools. Investigating the activities in which the boys are actively interested, these committees made up lists of shop projects comprehending the same interests and activities. Fifth grade boys reported that they were interested in bird life, garden work, baseball; and shop projects for this grade includes birdhouses, flower stands, garden apparatus and ball bats. Interests of boys in other grades are consulted in a similar manner and projects are listed suited to their interests and capacities. The expressed aim and objective in all this work is the setting up of situations identical with those in adult life and cultivation of resourcefulness in meeting situations. As an educational device this course of study is a significant recognition of education as a process of teaching boys and not subjects, an exemplification of the pedagogical doctrine that teaching people to appreciate and interpret and make use of the present in itself training that will guarantee ability to appreciate, interpret and make use of the future.

In an article published during the current year another midwestern writer lays down several kindred

[1]Course of Study in Industrial Arts for 5th, 6th, 7th, and 8th grades. Cincinnati Public Schools. E. W. Christy, Director of Industrial Arts. Denton Bldg., Cincinnati, Ohio.

[2]The Real Job, R. W. Selvidge, Industrial Education Magazine, August, 1923, pp. 35-38.

propositions upon which to organize manual-arts work.[2] Asking the question: "What in the way of manipulative processes, and information about them, should a boy know who has completed a given grade?", he examines life activities of the adult householder, determines those that may be classed as manipulative processes and then suggests some which the school may be held responsible for teaching. I quote a few of a rather extensive list:

What should an eighth grade boy know and be able to do?

How to nail and draw nails.
How to use a saw.
How to use a plane.
How to drive screws.
How to sharpen edged tools.
How to cut and set glass.
How to solder.
How to clean and refinish floors.
How to install electric bells.
How to renew fuses.
How to wire a socket and plug.
How to care for a house furnace.
How to read working drawings.
Know sizes of commonly used nails, brads, screws, tacks and how sold.
Be able to distinguish more common metals: cast iron, wrought iron, tool steel, copper, brass, etc., and know their distinguishing qualities and uses.

He then gives reasons why the boy should know and be able to do these things:

Because practically every man, without respect to his vocation, often needs to know these things.
Because the boy must be able to do them in order that he may contribute his share to the upkeep of the home and meet his own needs.
Because such knowledge tends to make the boy self-reliant and gives him confidence in his ability to meet difficult situations.
Because such knowledge will often save him the time and money involved in calling in "experts" for small jobs.
Because it may give the boy some insight into industry, and may lead to the discovery of some interests and abilities not known before.

He then suggests how these things may be taught to boys:

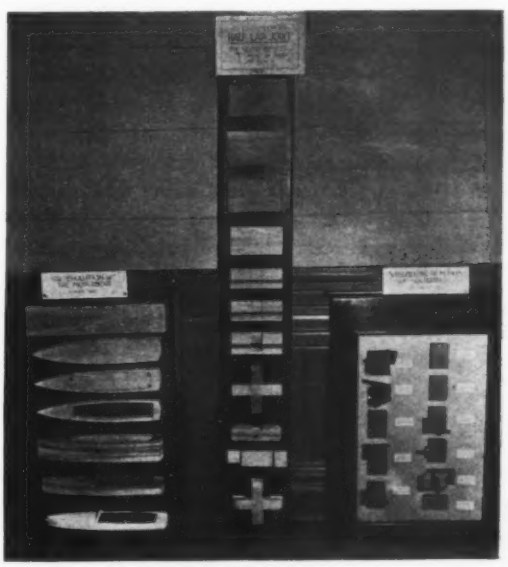
By posting in the classroom these objectives, making it clear to the boys that they are expected to know and be able to do these things.

By checking each boy at the beginning and giving him credit on the list for what he already knows.

By providing work for boys that will give them training in lines in which they are not proficient.

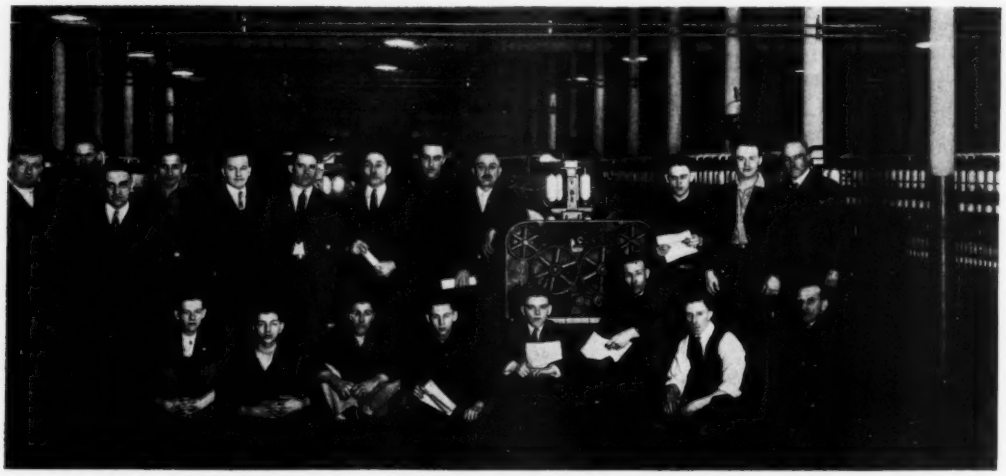
He suggests that there should be posted in the shop-room a list of the things we expect the boy to do and to know and that each boy be given a copy of the list. This gives him definite objectives and incentives to effort. Knowing what is expected of him is a challenge and an inspiration. It is the effective and appealing element in the Boy Scout program. It enables the boys to check their own levels of attainment.

When the boy has reached a degree of efficiency set for the shop he should be given credit for it just as the Boy Scout is given credit for passing a test. The student should know how the thing is done and should have sufficient skill to do the work in a way that will suffice in an emergency. Such training is not intended to be vocational but is designed to be a part of his equipment to do the things which all men should know and be able to do without respect to their vocation. Nowhere do we find the suggestion that such work is designed to lead to a specific vocation, but rather it is justified on the basis that it is *essential general training without regard to the future vocation of the boy,* an organized effort to enable the individual to gain useful and essential control of mechanisms in his environment of which he must make constant daily use. This program has the virtue of extreme flexibility, of adaptability to local conditions, materials and equipment. It is largely suggestive of possbilities and may be modified, amended or curtailed at the discretion of the user. The media employed may be varied to include wood, sheet metal, cast iron, steel, and concrete. Basing the selection of media and activities upon environment of the pupils as revealed in their interests, work may be prepared that will appeal to any and all individuals in any social and economic level. Definite instruction sheets should be prepared in advance which may be placed in the boy's hands when needed. Having before him definite objectives to work toward, objectives that are representative situations in everyday responsibilities in home and business environment, the boy's responses will be normal and effective because the situations are real; and the results obtained through this approach will deliver the school from the stigma of offering activities that are artificial and unrelated to practical life. In its very nature such a program is exploratory, drawn from a wide range of activities, consciously selected to broaden mental horizons and experiences, and entirely consistent with the spirit and practice of the junior high school.



USEFUL EXHIBITS.

We hear much about "revolutions." Here are some "evolutions" visualizing the method of developing some manual training projects in the Buffalo schools. A toy motor boat, School No. 62, a plant stand, School No. 2, and a practical method of teaching the use of the try square, are shown here.—Hiram E. Greiner.



EVENING TEXTILE CLASS IN ROYAL MILL, RIVERPOINT, R. I. THE MILL CORPORATION OPENED THE FACTORY IN ORDER THAT INSTRUCTION MIGHT BE GIVEN IN ACTUAL CONTACT WITH MACHINERY. THIS IS A NEW FACTORY USING THE MOST MODERN TYPE OF MACHINERY.

Hitching Vocational Education to Industry

Charles Carroll, Director of Vocational Education, Rhode Island.

VOCATIONAL education is firmly established. It has cost millions of dollars of federal, state and municipal revenues; it has required untold and unstinted energy, and the process of defining and distinguishing vocational education from the cultural education of manual arts and the brain-hand-skill type has involved almost limitless patience and experiment. Vocational education has won its way through, the field for vocational education has been reasonably well defined, and lines along which progress may be made are fairly well understood. This much has been accomplished, for the most part, in the past seven years, in which vocational education has been promoted by federal appropriations and in which the Federal Board for Vocational Education and, in each of the 48 states, the State Boards for Vocational Education have cooperated in carrying into effect very carefully formulated plans.

Paradoxical as it may seem, education of the manual-arts type, clearly removed from the vocational field, is stronger now than seven years ago, or even before, because of recognition of the proper place of such subjects in cultural curricula. A purely cultural education is obviously incomplete if skill of hand has been omitted, and wofully deficient and narrow if no attention has been given to contact with tools. How ill spent the leisure of the scholar and gentlemen who know not the solace of an hour or two of constructive work-play at a bench, or of creative art in some familiar medium! On the distaff side, how unfortunate the woman who has mastered the Seven Liberal Arts and has never known the pleasure of achieving a masterpiece in crust, batter or sponge, or in cotton silk or wool, or in straw, feathers, felt and artificial fruit or foliage! For what does it profit a man if he knows all things in books and loses his hands? The scholar who has no outlook upon an occupation for activity out of reading hours surely is as badly off as was the famous captain of industry who, when turned loose for a vacation, spent it at Monte Carlo.

Perhaps the most significant development in vocational education in the seven-year period just past has been a more definite realization of an intimate relation between vocational education and industry. Education offering training in occupations to boys and girls or men and women might be called vocational education literally; but education for occupations without consideration of the demand for and supply of workers in the field, that is education for occupations without a reasonable certainty that employment may follow training, violates the spirit of vocational education. A great many failures in vocational education have been clearly due to neglect of the factors indicated; others may be predicated to planning based almost exclusively upon the possibility of the introduction of "vocational courses" with little or no equipment, or with equipment available at low cost. Machine shops or wood shops have been installed on the latter basis in schools and courses labelled "vocational." Manual-arts instruction is on a better basis in many schools at the present time, because equipment installed for vocational education has been made available for cultural shop courses when it was demonstrated that the purpose of vocational training had been mistaken. As a rule any course of vocational education inaugurated with consideration exclusively of the school factors, and without careful investigation of employment factors, is undertaken with the chances weighed against success. One of the earliest indications of failure is a want of pupils willing to take a course that has no employment outlook. The field for vocational education is bounded by the possibilities of employment either in the community served directly by

the school, or in communities not far removed therefrom. One of the most important duties of the efficient supervisor of vocational education is the making of occupational surveys and the investigation of employment possibilities determined by the demand for workers and the supply of skilled workers available. The principles involved are neither new nor novel; schoolmen, with the great faith in education of any type that is characteristic of the profession, have viewed the problems of vocational education with greater emphasis upon "education" than upon "vocation," although in this instance the modifier is quite as significant as the substantive word. Schoolmen engaged in vocational education have learned the lessons of fruitful experience in recent years; hence the change of viewpoint.

The service of the Federal Board for Vocational Education and of State Boards in war times in training groups of mechanics in intensive short unit courses for occupations incident to or auxiliary to military service has frequently been commended, and the coincidence of the enactment of the federal vocational law with the participation of the United States in the World War has been evaluated as fortunate because of the organization for vocational education made available thereby. That the war, and the opportunity for service presented thereby, were equally fortunate for vocational education has not been so generally recognized. Yet out of the lessons learned in job analysis and the development of short, intensive courses of training leading directly to war-time employment, have come an almost entirely new vocational attitude in education. The unit courses planned and tried out in the war emergency have become part of the stock in trade in vocational education, and the success with these has led to further analysis in industries, a better classification of jobs, and the application of a new technique of instruction, also a product of the war-time classes. While the war emergency absorbed for the time being almost completely the activities of vocational staffs organized to carry the federal legislation into effect, it furnished an invaluable school of experience, and advanced the cause of vocational education tremendously thereby.

Vocational education should be organized as an auxiliary to industry. A purpose to "promote the liberal and practical education of the industrial classes in the several pursuits and professions of life," such as was enunciated in the Morrill act (1862) which laid the foundation for the American system of federal-state colleges, is commendable but scarcely sufficient, principally because the application is general rather than particular and specific. The declaration of purpose in the constitution of the Rhode Island School of Design (1877), "to furnish such instruction in freehand and mechanical drawing, painting, modeling, and designing as is required by artisans," is somewhat closer, and the Rhode Island School of Design has developed into a model vocational school, largely because of a state interest clearly recognized, as indicated in a declaration made by the board of managers (1883): "The State of Rhode Island is dependent in an unusual degree upon its manufacturing industries. The most successful manufacturers are those who keep abreast of the times. The most skilled workmen still come to us from abroad. The action of the legislature last year shows that it sees no reason why the inventive Yankee should not take his place beside them." The action of the legislature consisted in provision for free state scholarships for vocational courses, to be awarded to persons engaged in industry or preparing to enter industrial employment. Year after year since 1883 school and state have cooperated in the work of preparing artisans for more skilful employment in Rhode Island industries, and two notable special departments a textile school and a jewelry school —have been established with additional cooperation on the part of captains of industry, managers, and owners, who realized the service to industry and the value to Rhode Island industries of a school offering training highly specialized to meet the needs of industry. This has been an ideal *hitching of education to industry.* Out of the school have come class after class of artisans prepared to participate in industry, and to improve the quality of the product because of the emphasis upon art and design that has continued to be characteristic. To meet particular conditions special classes have been organized from time to time. Employers have encouraged workers to attend the evening classes in preparation for promotion. Rhode Island industry is infinitely better because of the Rhode Island School of Design, and Rhode Island has continued to maintain rank as a leading industrial state in face of vigorous competition, largely because of the fineness of the product of its industries, this due to the highly trained skill of workers. Rhode Island still leads in textiles, jewelry, and fine tools and machinery, all industries in which the factors of art and design are significant.

In recent years the vocational staff in Rhode Island, organized under federal and state laws, while cooperating with municipal school committees and superintendents of schools in promoting vocational courses in schools, has emphasized attention to the needs of industry. Continuation classes have been organized under joint agreement with employers in leading industries to send their apprentices to these classes in work time paid for by the employer, conditional upon the teaching in these classes of subjects actually part of the trade, and in many instances foremen in charge of apprentices, realizing the practicability of the instruction and its direct application to industry, have themselves attended the apprentice classes for instruction. These classes have been taught by teachers recruited from industry, and courses have been carefully planned with emphasis upon Rhode Island conditions. Most notable success has been attained in classes for machine shop and iron and steel workers, and for jewelers, particularly in design, engraving, stone setting, and die cutting. A general continuation school for the exclusive purpose of teaching English

has been established in a rubber factory, after a strike had demonstrated that a reading and speaking knowledge of the common tongue is essential to satisfactory employment conditions. Here again education is hitched to industry.

During the winter and spring of 1923-24 a novel and unusual experiment in evening vocational courses for textile operatives was undertaken, with results that indicate complete practicability. This work was considered of so vital importance to the textile industry —as the state's leading industry—that the State Board for Vocational Education assumed payment of the total salaries of instructors from state and federal appropriations. Instructors were recruited from the industry, superintendents and overseers being chosen with special reference to rating as successful managers with personality, ability to handle men, practical knowledge, and indication of ability to teach. Training in methods and assistance by suggestion while in service, was given by the state supervisor assigned to follow the experiment closely. Classes were conducted in schoolrooms made available by public school officers, in halls and in the factories, as seemed convenient and desirable. The fact that teachers were overseers and superintendents made much simpler the problem of actual contact with machinery in instances in which this seemed necessary, as in the classes in loom fixing. The courses were planned on the short unit basis, after careful analysis, in such manner that it was possible for an operative to attend instruction in a particular field to meet his special needs.

An outline of courses follows:

Carding—Cotton, 1 night; pickers, 4 nights; cards, 6 nights; drawing frames, 2 nights; fly frames, 6 nights.

Spinning—Ring frames, 4 nights; yarn calculations, 4 nights; spoolers, 1 night; warpers, 1 night.

Weaving—Slashers, 1 night; Northup loom, 5 nights.

Loomfixing, 20 nights, including (1) tearing down and rebuilding plain looms, (2) set harness cams for time and position, (3) cone picking motion, (4) assembling harness cams and rollers for simple weaves, (5) adjusting lay for correct beating up of cloth, (6) let-off motions, (7) take up motions, (8) shuttles and shuttle boxes, (9) adjustment of protection devices, (10) adjustment of filling stop motion, (11) Draper automatic looms, (12) Stafford automatic looms.

EVENING TEXTILE CLASS MEETING IN FIREMEN'S HALL, CRAMPTON, R. I. THE BLACKBOARD SHOWS GAIN CALCULATIONS. THE MACHINE WAS LOANED BY THE MILL CORPORATION.

EVENING TEXTILE CLASS MEETING IN PUBLIC SCHOOL BUILDING IN WEST WARWICK, R. I.

The students were recruited exclusively from operatives, the instructors were overseers and superintendents highly skilled as specialists, and a large part of the instruction was actually given in the factories under factory conditions. The last was an essential factor in the success of these classes.

This hitching up of education with industry has been definitely planned as one element in the solution of general problems facing the textile industry in Rhode Island. While unskilled operative labor is obtainable in quantity, and drawn to the state in additional quantity as required by the exigencies of industrial prosperity, there is a constant demand for skilled labor not so readily supplied. This type of operative is needed for employment as second hands and foremen, while the industry offers abundant opportunity for advancement as overseers and superintendents. In a wholesome development of an industrial organization it is desirable that a fair proportion of the supervising and directing forces shall be recruited from the workers, always allowing for improvement through exchange and through the innovations suggested by graduates of technical schools taken directly into employment. The textile industry in New England is facing a competition in the manufacture of coarse goods that suggests a gradual change from these to finer qualities and fabrics involving a larger use of design, more intricate processes, and the employment of a large proportion of highly skilled labor. The winter and spring classes were undertaken primarily to demonstrate the feasibility of intensive training in the textile industry through an educational organization, and to show that educational methods may be employed in industry economically and with results that are immediate as well as permanent. Education has been definitely

hitched to the textile industry in Rhode Island, and the value of the correlation has been proved in the first effort. This is bona fide vocational education, and the outlook warrants cheerful optimism.

Lest the impression be gained, mistakenly, that Rhode Island in encouraging vocational education has been concerned exclusively or principally with the interest of industry from the viewpoint of the employer, it is worth while to mention also several series of classes inaugurated and conducted in cooperation with labor union organization. These aimed to provide for apprentices particularly, and in certain instances for journeymen also, definite instruction in trade theory or trade practices. Most notable success has attended classes for electrical workers in Providence. These classes were organized at the request of the labor union, and the courses were planned in collaboration to present the detail of trade practices wanted. During three winters the course of instruction has developed progressively. The classes have been conducted at the Providence Trade School in the evening, with ample provision for equipment, apparatus for demonstration, and opportunities for carrying out the details of operations in practice and with careful attention to technique. This again is real vocational education, through education hitched to industry.

Rooms and Equipment for Industrial Arts

Samuel A. Challman, State Inspector of School Buildings, St. Paul, Minn.

(Concluded From July)

The Composite Shop

It is evident from the extracts quoted, as well as from the periodical literature on the subject, that our ideas and aims with regard to industrial training have undergone a marked change within a very few years. From a centralized interest along one line of industrial work we have gone into diversified activities, much after the fashion of the progressive grain farmer who has gone into diversified farming. The composite shop with its broader interests and its revelations of useful occupations presents a much larger and a better educational appeal. It is more in keeping with the general tendency of our present educational program.

How this type of shop is developing is an interesting study. Four floor plans from widely separated parts of the country are here given to show various tendencies along industrial lines. The plan of the shop in the Dover, Delaware, high school has been furnished by Supt. W. B. Thornburgh. It shows a carefully planned, well equipped, wood working shop with separate rooms for machinery, tools, benches, and finishing. A very interesting shop with the work under the direction of one instructor is the shop for home and community occupations, suggested by the State Department of Vocational Education for California, the floor plan of which has been furnished by G. A. McGarvey, Agent for Industrial Education for the Federal Board. The various industries to which pupils are introduced include home carpentry, concrete construction, furniture repair, upholstery, shoe repair, electric wiring, sheet metal work, plumbing, iron work, auto repair, agriculture and applied science. In the new Geneva, Ill., Community High School, the industrial arts room is located above the boiler room and the room for agricultural mechanics. The room is equipped for wood work and is an excellent illustration of how work benches and machinery may be placed to advantage in the same room. The floor plan has been prepared for this article by Supt. H. M. Coultrap of Geneva. In agricultural regions, it is to be expected that a shop will give particular attention to the problems of the farm. The Eyota, Minn., industrial rooms, in their new school building erected two years ago, include a general shop for all types of farm repair work, storage room for shop supplies and farm products, and a combined recitation and laboratory room. The work done by the pupils in this department and the facilities offered for carrying on successful work has been commented upon very favorably in publications issued by the Delaware State Parent-Teacher Association. The floor plan showing the arrangement of the equipment has been prepared by the principal of the school, Mr. B. O. Norby.

As illustrations of how the idea has actually worked out, the following extracts from a statement by Robert A. Campbell, state supervisor of industrial education of New Jersey, are both interesting and enlightening: "Probably one of the best types of the

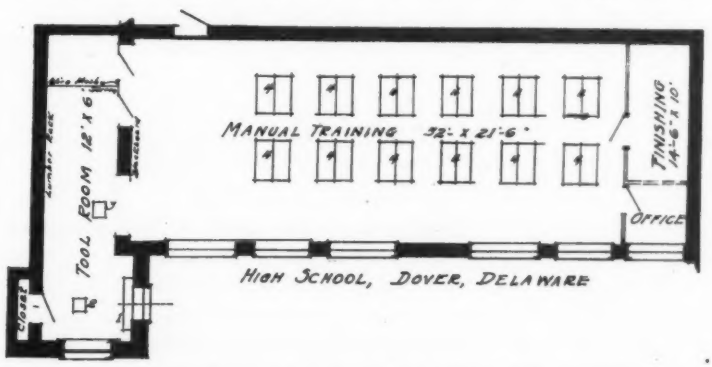


Fig. 10. Manual Training Department, High School, Dover, Delaware. Complete Equipment for a small High School where Wood Working is taught. Traced by R. Jones of the Dover High School. Floor Area 1,647 Square Feet.

EQUIPMENT SCHEDULE.

1. Lathe 6′ x 16″
2. Band Saw 2′ x 10″ x 2′ 10″
3. Planer 2′ 3″ x 3′ 3″
4. Manual Training Bench 48″ x 45″

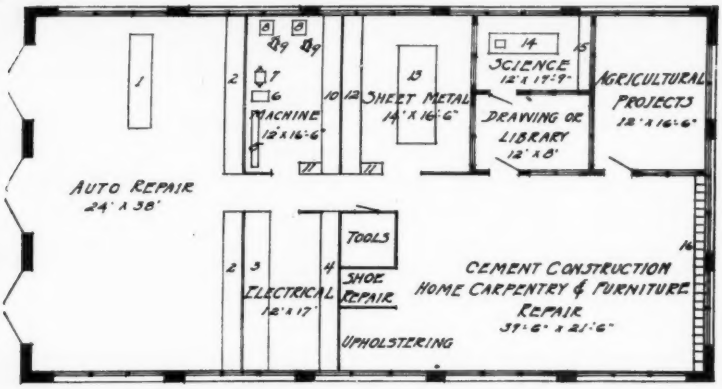


Fig. 11. Home and Community Occupations. Suggestive Sketch for Junior High Schools Recommended by the State Department of Vocational Education for California. All Activities to be taught by One Teacher in Detached Building. Total Floor Area 2,888 Square Feet.

EQUIPMENT SCHEDULE.

1. Pit 10' 4" x 2' 6"
2. Auto Bench 17' x 26"
3. Electrical Bench 17' x 36"
4. Electrical Bench 17' x 26"
5. Engine Lathe 6' x 11"
6. Drill Press 20" x 12"
7. Grinder 12" x 12"
8. Hand Forge 18" x 18"
9. Anvil 18" x 10"
10. Machine Bench 17' x 26"
11. Book Case 34" x 11"
12. Plumbing Bench 17' x 26"
13. Sheet Metal Bench 10' 6" x 4'
14. Laboratory Table 7' 4" x 2'
15. Cabinet 7' 10" x 15"
16. Lockers 12" x 12"

'composite shop' will be found in the Hackensack high school. The room is sufficiently large and so built that divisions may be made which will clearly distinguish sections of the shop as representing different types of work. In this room will be found a complete wood working equipment with wood working machinery installed. About the same amount of space is given over to sheet metal work, forging, cement work, electricity, and a moulding bench for the purpose of teaching foundry practice. The room is not partitioned to set off these units of industrial tryouts, but the benches have been carefully placed so that the boys sense a different environment when making initial contact with a number of the fundamental industries offered in a 'composite shop.' The justification for this organization in the school shops, particularly in the junior high school, is that 'there will be an opportunity for the pupils to explore several fields to see where they are fit.'

"This type of work has been materially strengthened in Hackensack by making such projects as would involve a minimum amount of duplication in operation but in general give a wide range of operations in several activities. To illustrate: A steam engine was made that permitted simple operations in wood, sheet metal, forging, pattern-making, foundry (casting in soft metal), wood turning and thread cutting. In some cases the factory method was used for duplication of parts. Group instruction was employed with a foreman in charge of each group. Each group rotated from one activity to another. Consequently, all had a sampling of the medium mentioned. With this project came the development of the drawing and mathematics involved with the problem and a study of the science related to the project."

Speaking of the junior high school of Montclair, Mr. Campbell says: "In Montclair it is not intended that the industrial arts courses in the junior high schools shall be interpreted as vocational or prevocational subjects guiding the pupils into the industries. The aim is the immediate motivation that lies in the finished product. In the shops there is no manual training of the old order. Boys make furniture in the form of desks that can be used, of step ladders that can be sold. Interesting here is the point insisted upon in the case of all articles sold. If step ladders can be purchased for an amount smaller than the actual cost in the shops, they are dropped from the course of study. In figuring the expense of a project, the time of the boy, the time of the shop instructor, and the cost of materials are estimated.

"Montclair, for instance, is not advocating vocational subjects for the junior high school. They feel that the experience, even in diversified shop activities, is not sufficient to be termed tryout units. The sole aim for offering varied types of shop work is to enable the boys to work in various materials which call for a variety of tools and a diversity of operations.

"Probably at no place has the play instinct been so strongly encouraged in boys as in Montclair. Great value is estimated in affording an opportunity to make high class toys. In their school shops are to be seen many water motors which will actually drive light machinery; beautiful miniature yachts made to compete in the yacht races given each spring. There are to be seen motor boats, steam engines, telegraph sets, bells

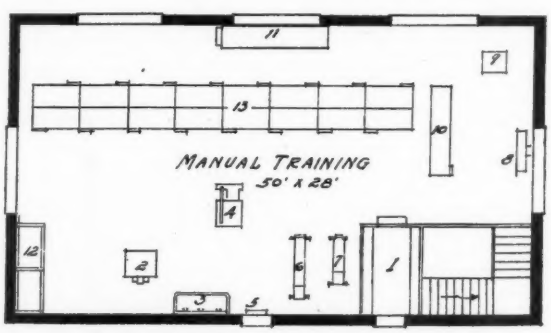


Fig. 12. Manual Training Room, Geneva, Illinois, High School. Stairs in corner lead to a room below for Agricultural Mechanics. Factory construction. Equipment adequate for a small high school where wood working is taught. Floor Area 1,400 Square Feet.

EQUIPMENT SCHEDULE.

1. Tool Room 5' 6" x 8' 6"
2. Variety Saw 36" x 30"
3. Sink 60" x 26"
4. Band Saw 48" x 30"
5. Towels
6. Wood Turning Lathe 72" x 12"
7. Wood Turning Lathe 54" x 12"
8. Hand Planer 48" x 10"
9. Combination Grinder 28" x 24"
10. Instructor's Bench 8' 8" x 24"
11. Glue Bench 10' 2" x 26"
12. Wood Rack 8' 10" x 2' 8"
13. Student Benches 54" x 26"

wired, and ingenious inventions which boys have contrived in order to make their toy boats a bit unusual. In going through this room a visitor exclaimed, 'It is a child's paradise.' "

The Unit Shop

As the enrollment increases, the small general shop gradually gives way to the unit shop, in which facilities for work and character of instruction can be made to appeal more strongly to the interests of the growing boy. they were easier to secure. They might as well have been plans from almost any other state in the Union, as the general character of these unit shops is very much the same wherever found.

Mechanical Drawing Room

The tendency has been to make the mechanical drawing room larger than really necessary, owing to the notion that drawing tables should be arranged much after the fashion of school desks. For this reason, two

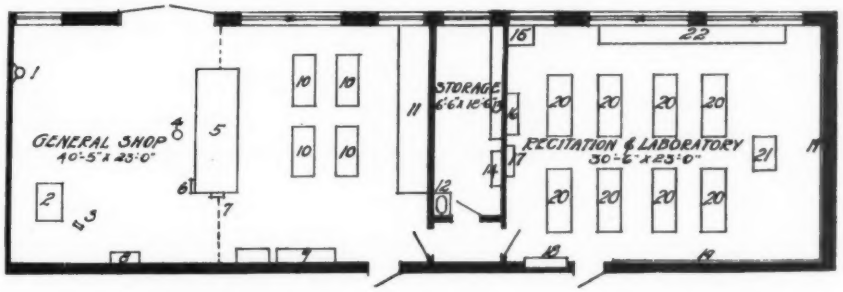


Fig. 13. Agricultural and Home Mechanics, Eyota, Minnesota, Consolidated School. Total Floor Area 1,780 Square Feet.

EQUIPMENT SCHEDULE.

1. Drill Press 24″ x 12″
2. Forge 48″ x 30″
3. Anvil 24″ x 12″
4. Drain
5. Work Table — Soldering—Painting—Glass Cutting — General Repairs — 12′ x 48″
6. Mechanic's Vise
7. Pipe Vise
8. Motor and Emery Wheel Table 30″ x 12″
9. Tool Cabinet 5′ 6″ x 1′ 6″
10. Wood Working Benches — 60″ x 24″
11. Lumber Rack — 16′ x 3′ x 6½′
12. Wash Basin 28″ x 21½″
13. Storage Shelves 11′ x 14″
14. Cabinet with lock for reserve supplies 42″ x 12″
15. Germinating Table 30″ x 24″
16. Magazine Rack — 48″ x 12″ x 6′ 10″
17. Sectional Bookcase — 36″ x 8″
18. Built-in Bookcase 48″ x 12″
19. Blackboard
20. Student Tables 72″ x 28″
21. Teacher's Desk 42″ x 28″
22. Lab. Work Table (Water—Gas—Lead trough) 18′ x 22″

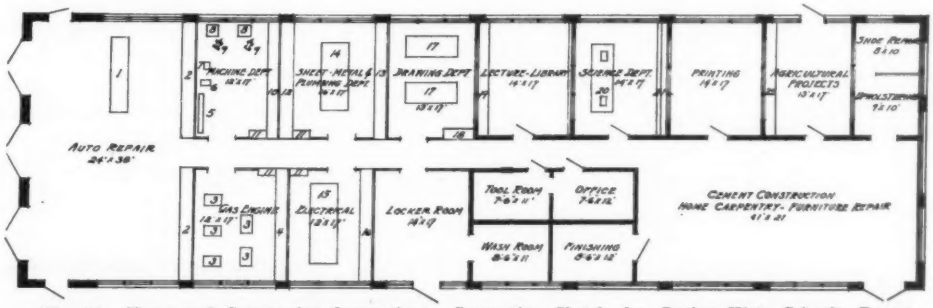


Fig. 14. Home and Community Occupations. Suggestive Sketch for Junior High Schools Recommended by the State Department of Vocational Education for California, in Building Erected Exclusively for Industrial Arts Two, Three or Four Teacher Shop for 40—60—80 Boys each Period. Total Floor Area 4,940 Square Feet.

EQUIPMENT SCHEDULE.

1. Pit 11′ x 2′ 6″
2. Auto Bench 17′ x 26″
3. Gas Engine
4. Gas Engine Bench 17′ x 22″
5. Engine Lathe 6′ x 14″
6. Grinder 12″ x 12″
7. Drill Press 20″ x 12″
8. Hand Forge 18″ x 18″
9. Anvil 18″ x 10″
10. Machine Bench 17′ x 26″
11. Book Case 34″ x 11″
12. Sheet Metal Bench 17′ x 24″
13. Plumbing Bench 17′ x 22″
14. Sheet Metal Bench 10′ 6″ x 4′
15. Electrical Bench 11′ 9″ x 4′
16. Electrical Bench 17′ x 22″
17. Drawing Table 7′ 6″ x 3′
18. Drawing Case 4′ 6″ x 18″
19. Book and Display Case 17′ x 18″
20. Laboratory Table 10′ x 3′
21. Cabinet 17′ x 18″
22. Case 17′ x 18″

The provision for such shops will depend upon the kind of instruction that is likely to prove the most timely and valuable to the community as a whole. No general suggestions as to the order in which these shops ought to be made a part of the school curriculum can very well be given, but the plans of a few typical shops have been selected, as indicative of the sizes of rooms required, and the extent of the equipment needed. The fact that these are plans of shops in Minnesota and California has no particular significance, except that illustrative floor plans of the interior arrangement of these rooms have been included. One shows four rows of drawing tables and the other three. Both rooms are the same width. One requires 28.7 square feet per pupil and the other 38.3 square feet. The difference of 9.6 square feet will give an additional sitting to every fourth pupil.

There is no particular advantage secured by giving four aisles to three rows of pupils. The number of pupils, owing to the floor space needed for the equip-

ment would not be likely to cause any congestion, if the center aisle had twice as many pupils passing as each of the outside aisles. The instructor can reach each pupil for observation of his work just as satisfactorily and a little more rapidly in the plan showing four rows of tables than in the plan giving three. In order to avoid waste floor area, with drawing tables of the size shown, the smaller room is the more desirable.

Electrical Shop

The wiring booths have presented quite a problem in the arrangement of the equipment in the electric shop. At first it seemed logical to place them in a row equidistant from the windows and the interior partition, but this resulted in darkening the part of the room farthest from the windows to such an extent as to seriously reduce its usefulness. The booths were then moved closer to the inside partition but still placed so as to be free of access from two opposite sides. The advantage appeared questionable, however, and as more usable space and just as satisfactory work can be done by placing these booths up against the interior partitions, as shown on the illustrative plans of the electric

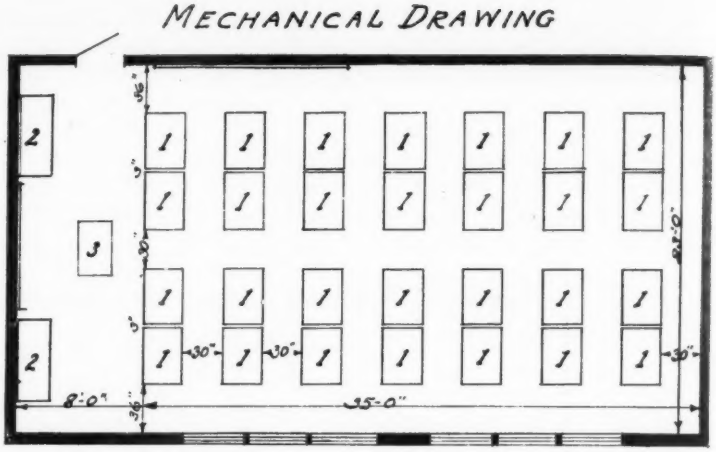


Fig. 15. Typical Arrangement of Drafting Tables in a Room with a Capacity for 28 Pupils. Prepared by the Department of Education of the State of Minnesota. Total Floor Area 805 Square Feet. Area for Each Pupil 28.7 Square Feet.

EQUIPMENT SCHEDULE.

2. Cabinets for Drawing Boards 5′ x 26″ 1. Drafting Tables 42″ x 30″
3. Teacher's Desk 42″ x 26″

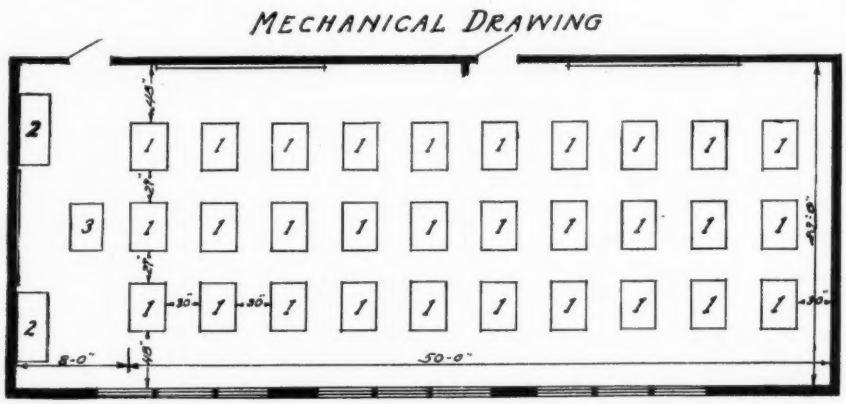
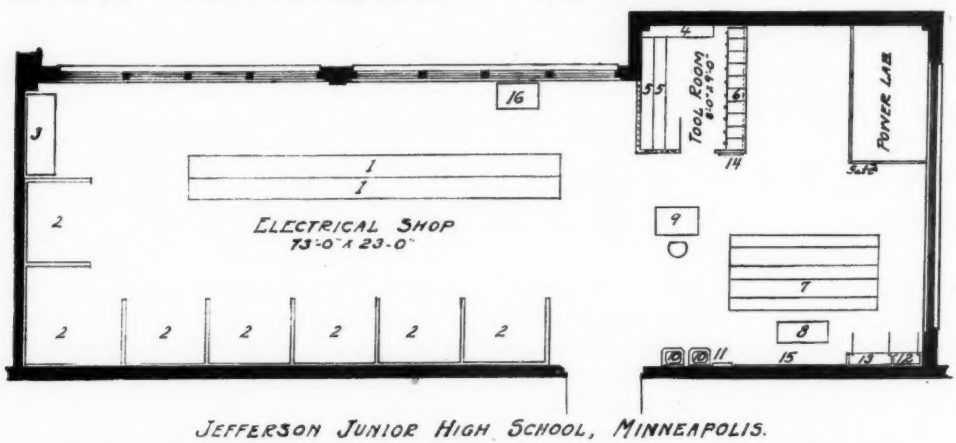


Fig. 16. A Spacious Drafting Room with Tables for 30 Pupils, Requiring a Floor Area of 38.3 Square Feet per Pupil.—Frequently Seen in New High School Buildings, but not Recommended as Economical or Essential for Successful Work. Total Floor Area 1,150 Square Feet.

EQUIPMENT SCHEDULE.

Drafting Tables 42″ x 30″ Cabinets for Drawing Boards 5′ x 26″ Teacher's Desk 42″ x 26″



JEFFERSON JUNIOR HIGH SCHOOL, MINNEAPOLIS.

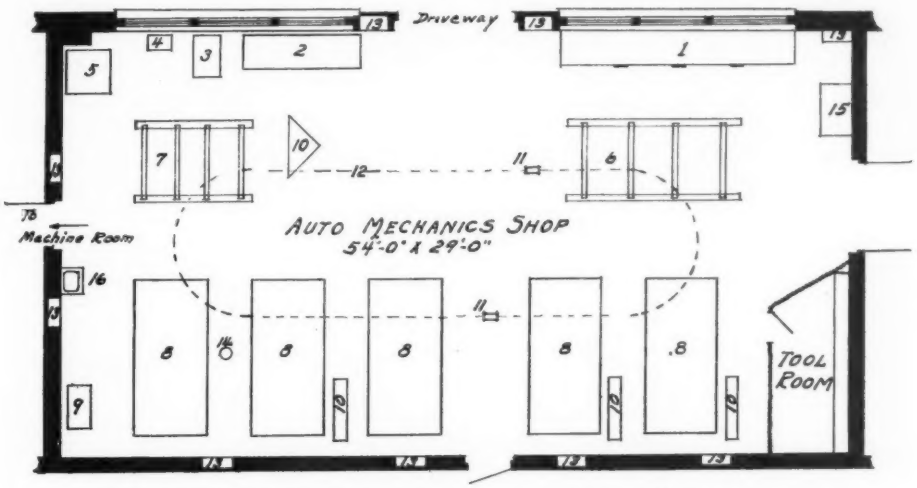
Fig. 17. Typical Arrangement of Modern Electrical Shop for Teaching Junior High School Classes as well as Vocational Classes. Total Floor Area 1,782 Square Feet.

EQUIPMENT SCHEDULE.

1. Bench—30′ 0″ x 3′ 6″
2. Wiring Booth 5′ 6″ x 6′ 0″ x 7′ 0″
3. Panel Board Case 6′ 9″ x 2′ 6″
4. Shelves 11″
5. Bins 12″ wide
6. Tote Boxes, each 11″ x 16″
7. Bleacher Seat 12′ 3″ x 6′
8. Demonstration Bench 4′ 2″ x 1′ 8″
9. Teacher's Desk 3′ 6″ x 2′ 4″
10. Lavatories 1′ 9″ x 1′ 6″
11. Towel Cabinet 1′ 8″ x 4″
12. Wardrobe 2′ x 1′ 3″
13. Bookcase 4′ 0″ x 1′ 3″
14. Corkboard 2′ 0″
15. Blackboard 10′ 0″
16. Lathe 3′ 4″ x 2′ 0″

shop, this arrangement has much to commend it. The equipment plans of this shop as well as the sheet metal shop and the wood working shop of the Jefferson junior high school, Minneapolis, have been worked out by J. E. Painter, supervisor of industrial arts of the Minneapolis public schools, and Geo. F. Hale, equipment engineer of the bureau of buildings of the Minneapolis public schools.

machine shop immediately adjoin it. The auto shop at the Edison junior-senior high school at Minneapolis meets both of these requirements. The door from the driveway into the auto shop is a vertical sliding door, which has its decided advantages. An overhead trolley system facilitates the movement of any heavy parts from the automobile to the racks shown on the floor plans. The provisions for gas exhaust through openings in the floor leading to flues connected to a fan exhaust eliminate danger to life and to health. The tool room, partitioned off from the shop by heavy woven wire is one of the most satisfactory ways in which to provide for such

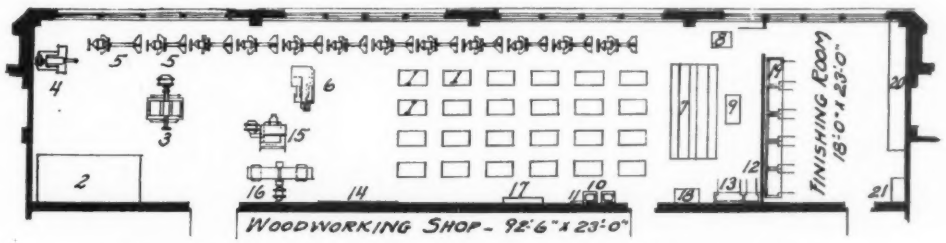


EDISON JUNIOR-SENIOR HIGH SCHOOL, MINNEAPOLIS.

Fig. 18. Well Designed Room and Well Arranged Equipment for a Junior-Senior High School. Total Floor Area 1,566 Square Feet.

EQUIPMENT SCHEDULE.

1. Bench 16′ x 28″ with three vises
2. Lathe 8′ x 28″
3. Power Drill 22″ x 35″
4. Grinder and Polisher 18″ x 12″
5. Forcing Press 36″ x 36″
6. Engine Rack 12′ x 5′ 6″ with movable cross bars
7. Engine Rack 8′ x 5′ 6″ with movable cross bars, gas exhaust openings in floor
8. Car Space.
9. Air Compressor 36″ x 18″
10. Portable Jacks 52″ long
11. Two One-Ton Spur-Geared Blocks
12. Overhead I-Beam Carrying Truck
13. Wall Sockets for Electric Connections
14. Drain 9″ x 9″
15. Teacher's Desk 42″ x 28″
16. Lavatory 1′ 9″ x 1′ 6″



JEFFERSON JUNIOR HIGH SCHOOL, MINNEAPOLIS.

Fig. 19. Complete Shop Fully Equipped for all kinds of Wood Work. Bleacher Seats for Recitation Purposes. Total Floor Area 2,541 Square Feet.

EQUIPMENT SCHEDULE.

1. Manual Training Bench 42″ x 22″
2. Lumber Rack 13′ 0″ x 6′
3. Single Planer 4′ 6″ x 3′ 3″
4. Mortiser 5′ x 3′
5. Wood Turning Lathe 3′ 6″ x 2′
6. Band Saw 4′ 11″ x 2′ 10″
7. Bleacher Seats 12′ x 6′ 3″
8. Grinder 2′ 6″ x 2′ 2″
9. Teacher's Desk 42″ x 24″
10. Lavatories 1′ 9″ x 1′ 6″
11. Towel Cabinet 1′ 8″ x 4″
12. Wardrobe 2′ x 1′ 3″
13. Bookcase 4′ x 1′ 3″
14. Exhibit Board 10′
15. Saw Bench 3′ 2″ x 4′
16. Jointer 8′ 2″ x 1′ 4″
17. General Tool Cabinet 5′ x 7″
18. Tool Cabinet 3′ x 1′ 9″
19. Students Locker Cabinet 3′ 6″ x 2′
20. Finishing Bench 15′ 6″ x 2′ 2″
21. Steel Supply Cabinet 2′ 10″ x 1′ 6″

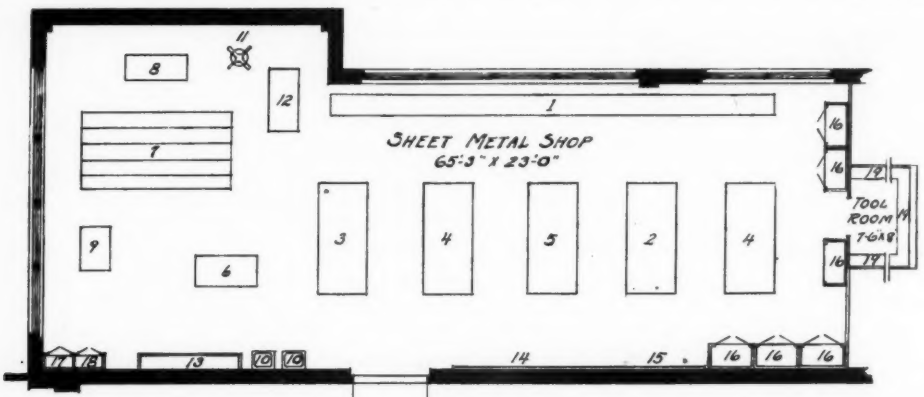
Auto-Mechanics Shop

A convenient location of an automobile shop in a school building requires, first of all, that a driveway lead directly into the shop, and secondly, that the

a room. A wicket in the wire door facilitates the distribution of tools and parts for which a signed written order must be given.

Wood Working Shop

The wood working shop is the successor of the manual training shop. It has dropped a number of the objective ideal, and the making of household furniture of certain types has been encouraged. The use of machinery for work of this nature is imperative and, on this account, space must be provided both for benches and machinery. This means a very large room. The floor plan of this room with an adjoining finishing

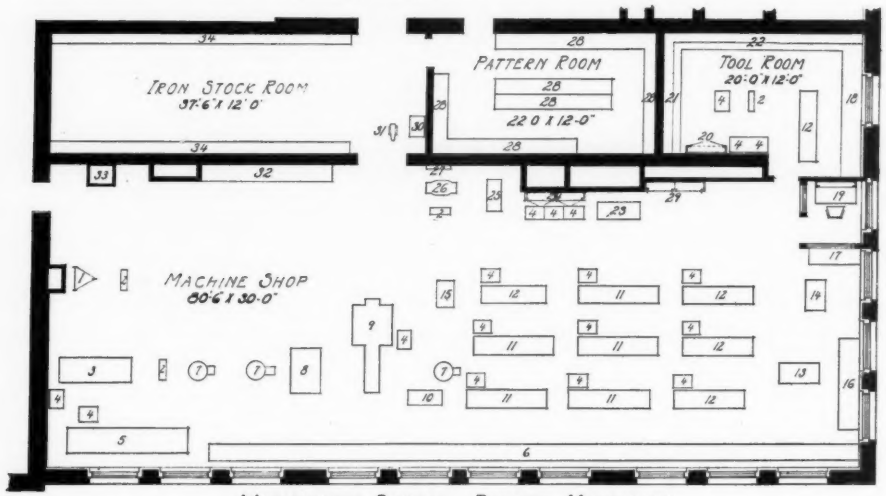


JEFFERSON JUNIOR HIGH SCHOOL, MINNEAPOLIS.

Fig. 20. Compact and Convenient Arrangement of Equipment in Sheet Metal Shop. Total Floor Area 1,560 Square Feet.

EQUIPMENT SCHEDULE.

1. Work Bench 36' 0" x 1' 10"
2. Machine Bench 8' 9" x 4'
3. Layout Bench 8' 9" x 4'
4. Stake Bench 8' 9" x 4'
5. Soldering Bench 8' 9" x 4'
6. Squaring Shear 5' x 2' 6"
7. Bleacher Seats 12' 3" x 6' 3"
8. Demonstration Bench 5' x 2'
9. Teacher's Desk 3' 6" x 2' 4"
10. Lavatories 1' 9" x 1' 6"
11. Setting Down Machine 3' 8" x 3' 8"
12. Combination Brake and Folder 5' x 2' 6"
13. Drip Trough 8' x 1' 4"
14. Corkboard 10' 6"
15. Blackboard 10' 6"
16. Locker Cabinets 3' 6" x 2' each
17. Wardrobe 2' 6" x 1' 3"
18. Bookcase 2' 6" x 1' 3"
19. Shelves 11" wide



WASHINGTON SCHOOL, DULUTH MINNESOTA

Fig. 21. A Model of an Excellent Arrangement of a Machine Shop, Designed for All Types of School Work. Total Floor Area 3,369 Square Feet.

EQUIPMENT SCHEDULE.

1. Crane 30" x 27"
2. Tool Tray 24" x 9"
3. Drill Press 7' x 30"
4. Tool Tray 16" x 24"
5. Lathe 12' x 30"
6. Bench 64' 6" x 21"
7. Drill Press 30" x 24"
8. Shaper 3' x 54"
9. Planer 9' 3" x 4'
10. Drill Press 42" x 18"
11. Lathe 8' x 22"
12. Lathe 7' x 22"
13. Milling Machine 4' x 2'
14. Grinder 3' x 2"
15. Grinder 2' 9" x 1' 9"
16. Bench 9' x 2'
17. Bench 5' x 22"
18. Bench 12' 6" x 24"
19. Instructor's Desk 48" x 30"
20. Cabinet 4' x 8"
21. Cabinet 12' x 20"
22. Cabinet 18' x 20"
23. Lathe 4' 3" x 20"
24. Cabinet 6' x 10"
25. Hack Saw 36" x 18"
26. Motor Grinder 36" x 12"
27. Electric Cabinet 30" x 6"
28. Racks
29. Cabinet 6' x 12"
30. Forge 30" x 18"
31. Anvil 18" x 10"
32. Bench 13' x 22"
33. Sink 39" x 24"
34. Racks

less valuable and sometimes questionable articles and exercises which characterized the traditional manual training shop. Cabinet making has become more of an

room in the Jefferson junior high school of Minneapolis is typical of space and equipment needed for a well planned wood working room.

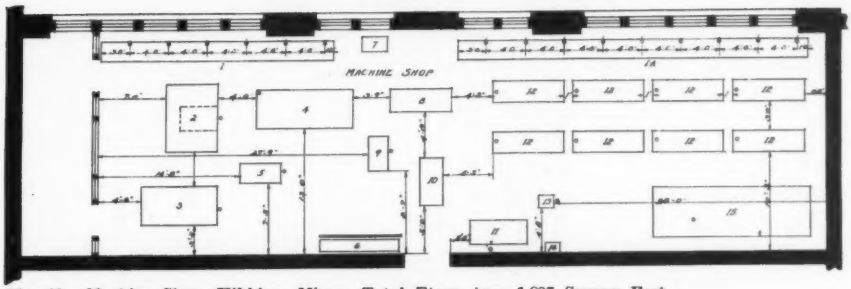


Fig. 22. Machine Shop, Hibbing, Minn. Total Floor Area 1897 Square Feet.

EQUIPMENT SCHEDULE.

1. Table 24′ x 24″
1A. Table 36′ x 24″
2. Univ. Miller 7′ x 5′ 3″
3. Shaper 8′ x 4′
4. Extension Bed Gap Lathe 10′ x 4′
5. Cutter and Grinder 48″ x 24″
6. Junction Box 8′ x 14″
7. Grinder 30″ x 18″
8. Speed Drill 6′ 3″ x 30″
9. Drill Grinder 42″ x 24″
10. Power Saw 5′ x 30″
11. Motor Generator 6′ x 30″
12. Lathe 7′ 3″ x 26″
13. Sensitive Drill 18″ x 15″
14. Motor Controller 18″ x 12″
15. Planer 16′ x 5′

Sheet Metal Shop

The chief requirements for a sheet metal shop are ample daylight and adequate floor space for handling materials. Large, heavily built tables, equipped with devices for working the sheet metal into various patterns, are best placed in a row about equidistant from the walls of the room. With this equipment may well be placed hot and cold water faucets of different designs so as to acquaint pupils with the troubles they are apt to meet in their homes, when the faucets get out of order.

Machine Shop

The machine shop in the Washington school at Duluth embodies in a very satisfactory manner the various features considered essential for such a shop. The machines have been arranged with a special view of routing the work in an orderly and efficient manner. The floor plan with its equipment schedule is the best interpretation of the requirements for a complete course of instruction along this particular line. Another fine example of a machine shop, with a floor area not much more than one-half as large as this is found at Hibbing, Minnesota. Floor plans of this shop are included among the drawings for this article and furnish valuable means of comparison as well as suggestion for elimination where

Fig. 24. View of the Print Shop, Aurora High School, Aurora, Minn.

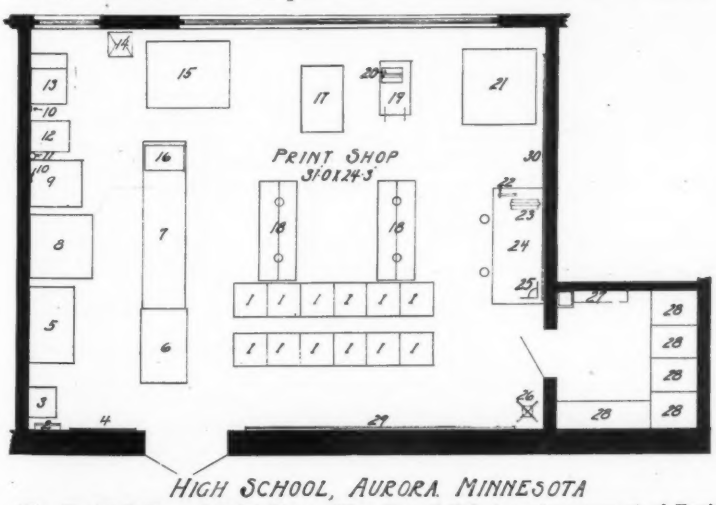


Fig. 23. Well Planned Print Shop, with a Very Satisfactory Arrangement of Equipment. Total Floor Area 822 Square Feet.

EQUIPMENT SCHEDULE.

1. Recitation Chairs
2. Paper Towel Rack
3. Lavatory 20″ x 22″
4. Bulletin Board 24″ x 48″
5. Roll Top Desk 32″ x 54″
6. Flat Top Desk 32″ x 52″
7. Work Table 10′ x 2′ 6″
   16 Draying Racks
   15 Storage Drawers
8. Movable Work Table 46″ x 46″
9. Twenty-four-inch Perforator 3′ x 2′ 10″
10. Wall Outlets
11. Floor Plug
12. Stitcher
13. Roller and Ink Cabinet 2′ x 3′
14. Waste Can
15. 12″ x 18″ C. & P. Press and Motor 5′ x 4′
16. Proof Press 12″ x 18″
17. Imposing Stone 30″ x 48″
18. Type Cabinets and Stand—each 48 cases 6′ x 27″
19. Type Cabinet Brackets—12 cases 3′ 3″ x 1′ 10″
20. Two Lead and Slug Racks 6″ x 15″
21. Paper Cutter — 30 inches 4′ 6″ x 4′ 6″
22. Lead and Rule Cutter
23. Paper Rack
24. Work Table
25. Mitering Machine
26. Hat and Coat Rack
27. Storage for Cut Paper 36″ x 96″
28. Paper Stock Bins 96″ high
29. Blackboard 16′ x 4′
30. Display Board 16′ x 4′

smaller shops are desired. A smaller shop may be designed for such elementary work as is ordinarily offered in the junior high school.

Fig. 25. Print Shop, Aurora, Minn., High School.

Print Shop

There are many suggestions for the arrangement of the equipment of a print shop. As a matter of fact, there seems to be more diverse ways of planning a print shop than almost any other type of school shop. The floor plan of the print shop in the Aurora, Minnesota, high school and the two photographs of this room are included, as they illustrate in a very clear way just what can be done in a room of the usual dimensions of a schoolroom. This room happens to be a little wider than the ordinary classroom but the width may well be reduced to 23 feet without impairing the arrangement.

Use of Equipment Plans

In making practical application of any of the floor arrangements shown, it is well to keep in mind that they are intended merely as guides for certain definite industrial courses offered, and that the omission of a part of such a course or any addition to it may alter the choice of equipment as well as its location upon the floor. Each project requires a careful study which should begin with the course to be offered in the school, followed by selecting the equipment necessary to give the proper training in the course, and completed by drawing the walls around the equipment and locating the room in its proper environment.

The Job Sheet

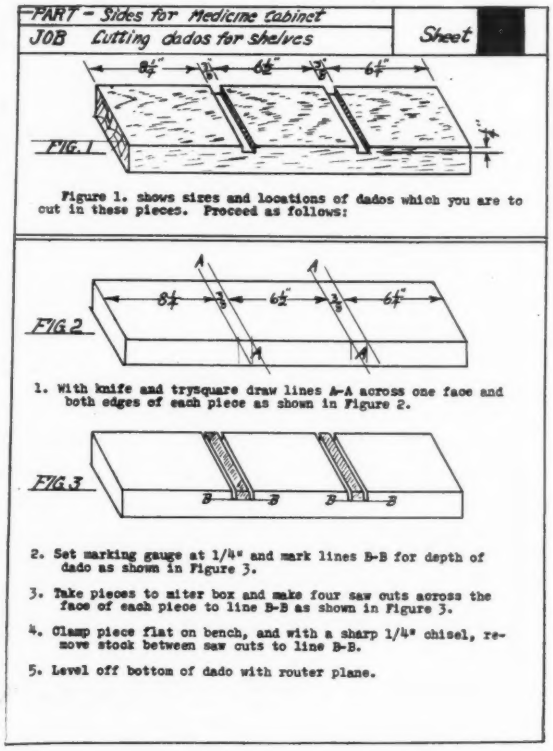
J. A. Murphy and J. Hackett, Fall River Boys' Continuation School, Fall, River, Mass.

THE Job Sheet, a logical outgrowth of the lesson sheet, began to attract attention about the time the United States entered the World War. The demand for skilled mechanics was great and the government in an attempt to satiate this need opened schools and training shops for the soldiers. The aim of these schools was to turn out good mechanics quickly.

The job analysis was resorted to, and the several operations comprising each unit job were treated singly and as one job. A job sheet was then made up, showing the part, dimensions, etc., and explaining how to do the work. This was the original job sheet. It worked fairly well. The student did the work, following instructions contained in the job sheet.

This type of sheet aroused considerable criticism because it lacked a check up on the work. It was too mechanical. The student often did not know why he did certain things and after doing them proceeded quickly to forget them. In other words the first form of job sheet gave the student's brain no exercise.

In order to minimize this feature and to afford the instructor a chance to check up on the work, a new type of job sheet was inaugurated. This consisted of three separate and distinct sheets or the one operation or job. These sheets I have called the: How?, Why? and What? sheets.


PART - Sides for Medicine Cabinet
JOB Cutting dados for shelves
Sheet
FIG. 1
Figure 1. shows sizes and locations of dados which you are to cut in these pieces. Proceed as follows:
FIG 2
1. With knife and trysquare draw lines A-A across one face and both edges of each piece as shown in Figure 2.
FIG 3
2. Set marking gauge at 1/4" and mark lines B-B for depth of dado as shown in Figure 3.
3. Take pieces to miter box and make four saw cuts across the face of each piece to line B-B as shown in Figure 3.
4. Clamp piece flat on bench, and with a sharp 1/4" chisel, remove stock between saw cuts to line B-B.
5. Level off bottom of dado with router plane.

THE "HOW" SHEET OF A JOB SHEET.

The How? sheet is purely shop practice. It should be a blue print of the job to be done, containing information about *how* it is to be done.

The Why? sheet contains questions pertaining specifically to the job (explained or contained) in the How? sheet. The material for this sheet must relate directly to the trade science required to do the job. This Why? sheet affords the instructor a very good check up on the student. Due to the material and references necessary on the Why? sheet, the classroom is the logical place for it.

The What? sheet usually contains the mathematical problems involved in the job and seeks for the solution of them through the student. This sheet is obviously a classroom job and the class must be run in conjunction with the shop.

When these sheets are carefully made out, the grading will take care of itself. The skilled student gets the difficult job. The new and inexperienced pupil is given a simpler one. He is then pushed along through the various difficulty levels until he too can do the difficult job. In this way, every student new or old is doing individual, graded work.

The fact that the student must secure information himself by resorting to references of all kinds enhances the value and interest of this type of sheet.

The mathematical problems connected with the job are practical and concrete. They stimulate the interest of the student because he can see their bearing and application.

To illustrate this let us take a job: Cutting dados for shelves in the sides of a medicine cabinet. The side has been cut out and finished to size previously.

When the pupil enters the shop he is given the side and the How? sheet (usually a blue-print) and told to do the job the sheet outlines. The sheet is numbered X-4. X indicates the project and 4 is the number of the operation, indicating that there were three operations previous to this one.

When the shop period is over the student enters the classroom and is given the set of three sheets. This set includes the sheet he has been working on in the shop, (the How? sheet), the related mathematics (the What? sheet), and the trade science (the Why? sheet). The last two mentioned sheets comprise his related work for the classroom.

Here are the Job Sheets for this job:

MEDICINE CABINET

Job: Cutting Dados for Shelves

Related Mathematics:

1. **Determine the length of the side in feet and inches.**
2. **Find the number of board feet in two of these sides. Allow 20% for waste and find the cost at $0.18 per bd. ft.**
3. **The groove is cut ¼" deep in a ⅞" board. What is the remaining thickness?**
4. **If the spaces between shelves were to be made equal, what distance apart would the dados be?**
5. **It takes a boy 95 minutes to complete this job. What would he earn if he were being paid at the rate of $0.27½ per hr.?**

MEDICINE CABINET

Job: Cutting Dados for Shelves

Trade Science:

1. **What tools did you use on this job?**
2. **Why is a knife line used instead of a pencil line?**
3. **At what angle should the miter box be set when making the saw cuts called for in operation 3?**
4. **These dados are used to hold shelves in place. What other methods could be used to hold shelves? State three. (Reference book on joints.)**
5. **Consult chapter on Pine in your Reference Book and:**

(a) Name three states that furnish the lumber dealer with pine. (b) State correct name for N. C. pine, and tell what it is used for. (c) What is Oregon Pine?

Construction of the Step-Down Transformer

E. W. Jones, Assistant Professor of Physical Sciences, State Teachers' College, Pittsburg, Kansas.

The building of a small transformer will be found an instructive and satisfactory problem to be worked out in the school shop. It involves the laminated core so necessary in alternating current apparatus, the ratios of voltages, currents, and turns, found in all transformers, large and small; the sizes, kinds, and carrying capacities of magnet wire, and the mechanical operations of coil construction. Also, many lessons in magnetism, induction, and the working principles of the transformer and induction coil may be applied and demonstrated in a most effective way.

The low voltage transformer may be put to so many uses, such as the operation of toy trains and motors, door bells, buzzers, spark coils, and low voltage lamps, to mention only a few, that the average boy is intensely interested in its construction, and will often buy the one he has built at school for use in his home shop.

The instructions and data here set forth will be found productive of good results, and adapted to the conditions and equipment of the school shop. The finished transformers are rugged, ample in capacity for continuous operation at rated output, and will carry overloads of 25 to 50 per cent for short periods, when well ventilated. It is recommended that they be built open to the free circulation of air around their coils and cores. Enclosing them in tight iron boxes, where circulation is cut off, will cause hotter operation and lower the capacity one-third to one-half. Where they are subject to moisture, violence or other forms of damage, however, such enclosure is advisable, and the rated output should be lowered accordingly.

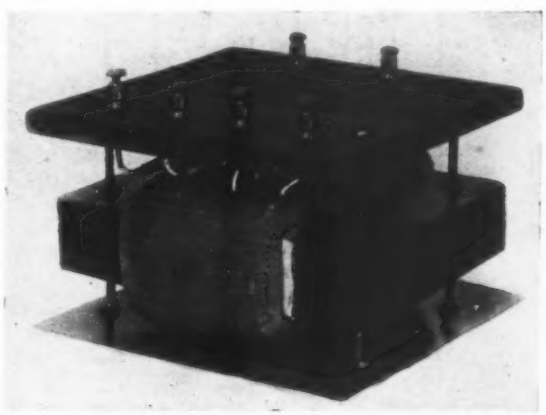


FIG. 1. A convenient form of mounting. One hundred ten-volt terminals in rear, low voltage terminals in front. Slate top, bottom of sheet iron. Ends of coils are sloped. Winding space of core was taped before placing it in coils. Wedges are inserted between coils and core to secure air ducts for ventilation. One can be seen.

Choosing the proper Transformer

In Tables I and II are given the principal dimensions of transformers suitable for almost any purpose desired by the amateur. If, however, a transformer of some other size, or voltage, is desired its dimensions may be calculated by following the method set forth later under "Design Calculations."

TABLE I—Coil Data for Low Voltage Transformers to Use on 100 Volt Circuits

Watts Output	Volts Output	Amps. Output	Number of Turns		Wire Size B & S Gauge		Wt. of Wire Approx. Oz.		Length of Coils Inches
			Prl.	Sec.	Prl.	Sec.	Prl.	Sec.	
10	6	1.6	2200	150	32	20	1.5	1.0	1¼
20	6	3.6	1200	72	27	16	5.0	5.0	1¼
20	20	1.0	1200	240	27	21	5.0	3.5	1¼
50	6	8.3	550	33	22	12	10.0	5.0	1¾
50	20	2.5	550	110	22	17	10.0	8.0	1¾
50	50	1.0	550	275	22	20	10.0	8.0	1¾
100	6	16.6	275	17	20	9	32.0	8.0	2
100	20	5.0	275	55	20	14	32.0	11.0	2
100	50	2.0	275	137	20	18	32.0	16.0	2
150	10	15.0	200	20	18	10	16.0	10.0	2½
150	30	5.0	200	60	18	14	16.0	10.0	2½

Each horizontal line of Table I carries complete coil data for one size of transformer having one secondary voltage. To obtain more than one voltage follow instructions as given under "A Multiple Voltage Transformer." If other sizes or voltages are wanted use the method explained under "Design Calculations for the Small Transformer." Core Data for above transformers will be found in Table II.

The first step in choosing the proper size of transformer for any purpose is to decide upon the voltage and current output desired, both of which are determined by the requirements of the devices to be operated from the transformer. For example, if a miniature train requires for its operation about 8 amperes at 6 volts pressure, these values determine the output or capacity of the transformer to be built. Their product; that is, volts times amperes, gives the watts output, which, in this case, is 48 watts. Then a 50 watt transformer may be constructed, according to data given in Tables I and II, having a primary voltage of 110, and a secondary voltage of 6 volts. This particular 50 watt transformer is shown by Table I to require 550 turns of No. 22 magnet wire for the primary winding and 33 turns of No. 12 for the secondary. It has a current output of 8.3 amperes, a coil length of 2¼ inches and core dimensions as given in Table II.

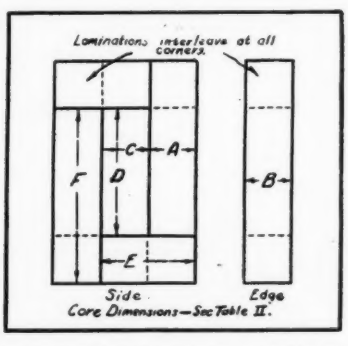


FIG. 2. Core dimensions for Table II.

TABLE II—Core Data for Low Voltage Transformers

A Multiple-voltage Transformer

Watts Output	Dimensions of Cores in Inches						Wt. of Cores Approx. Lbs.
	A	B	C	D	E	F	
6	½	½	½	1½	1	2	0.5
20	¾	¾	¾	1½	1½	2¼	1.5
50	1⅛	1⅛	⅞	2	2	3⅛	3.0
100	1½	1½	1	2¼	2½	3¾	5.5
150	1⅞	1⅞	1¼	2¾	3⅛	4⅛	9.0

Each horizontal line of Table II carries complete core data for one size (watts output) of transformer, to correspond with the same size of transformer in Table I. The same size of core is used with all transformers of a given wattage, regardless of voltage. Above dimensions refer to sketch of core, Fig. 2. They make a core of square cross-section, but any other shape giving same cross-sectional area may be used if the coils are shaped accordingly.

A Multiple-voltage Transformer

In the next line of Table I, below the data for the 6-volt transformer, is shown the data for a 50-watt transformer with a 20-volt secondary. The core and primary winding are the same as for the other voltage, the difference being only in the size of wire and number of turns on the secondary. In this case it will be a simple matter to combine both secondaries, the 6-volt and the 20-volt, into one coil, as shown on Plate A, and make a transformer that will deliver three voltages; viz., 6, 14, and 20 volts. This is done by putting on 33 turns of No. 12 wire for the 6-volt winding, then 77 turns of No. 17 wire for the 14-volt winding, making a total of 110 turns, as required for 20 volts. Both sizes of wire are wound on in the same direction. The end of the 33 turns must be connected to the beginning of the 77 turns, and no mistake made, so that when the connection is finished a continuous coil of 110 turns is obtained, all wound in the same direction. This connection between windings should be made on the outside of the coil, as a tap made within a coil usually gives bad results. Since it makes a rough place in the winding, it is difficult to insulate thoroughly, and often causes a short circuit. The leads from the two windings of the secondary coil should be brought straight out wherever they may be, as seen in Fig. 4, and any crossing over to reach the proper binding posts is done outside of the coil.

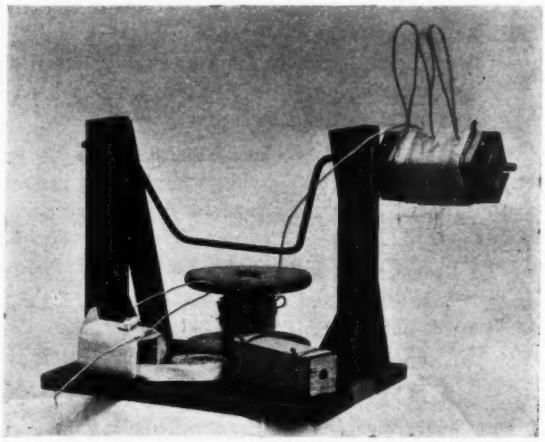


FIG. 3. Hand coil winder with a partly wound coil on mandrel. Note the sheet iron strips under insulating paper and heavy band wires to wind against, also how end of paper is cut into pointed flaps and folded over before taping. A method of securing end leads with a loop of tape is shown.

If desired, an additional 165 turns of No. 20 wire may be connected to, and wound on top of the 110 turns already in place. This will provide a 30-volt winding, which, in series with the other two, will deliver a total of 50 volts, with taps for 6, 14, 20, 30, 44 and 50 volts. Thus a multiple voltage transformer may be built merely by adding more secondary windings, which greatly increases the range of usefulness of the transformer without much increase in its cost. Where just one secondary winding is provided, containing only a few turns of wire, it is usually best to place it on top of the primary, with a layer of paper between. Such a plan is carried out in Fig. 7 (to be shown in the second part of this article). However, when two or more secondary windings are used, they should generally be made into a separate coil and placed on the opposite leg of the transformer, as in Fig. 1. Usually, also, the length E of the end core laminations must be increased over the dimension given in Table II, owing to the greater thickness of the finished coils. It is suggested that a measurement for these end laminations be taken after the coils are assembled on the side legs of the core, and their length made such that the coils will be about ¼-inch apart in the finished transformer.

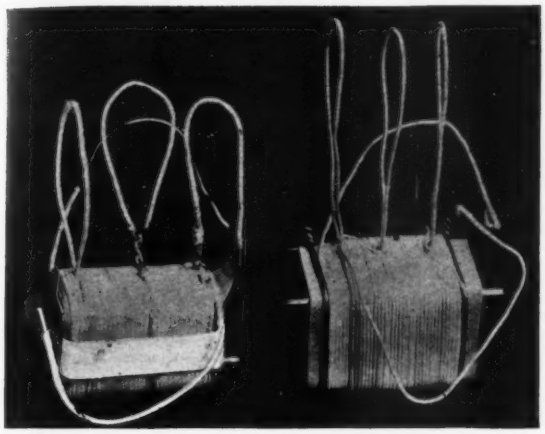


FIG. 4. A coil partly wound, showing how taps are brought out. A second coil, with winding completed, shows how taps are twisted, soldered, cut and taped before dipping.

The Coil Winder

After the capacity and the dimensions of the transformer have been decided upon, some method of winding the coils must be devised. The hand winder shown in Fig. 3 gives good service for coils made of wire sizes No. 30 and larger, and up to a few hundred turns. For a large number of turns of very fine wire a lathe is much more speedy, though the finished job will be no better. This winder is to be clamped to a bench. It should be made of 2-inch lumber, with standards 16 inches apart and 12 inches in height. The crank rod should be at least ½-inch in diameter, with about 8 inches extending to receive the mandrel, 6 inches of which are threaded. A nut and washer at each end of mandrel clamp it securely. The spool of wire should be mounted three or four feet away, to turn on a rod, with a tension band of wire or cord to slip in the groove found on one flange of the spool. One end of the tension band is secured rigidly, and the other is weighted to give the desired tension. Tension is very essential in winding a tight, solid coil.

Preparing the Mandrel

A mandrel to wind the coil upon may be made ot any wood convenient, an inch, or more, longer than the coil and ⅛-inch larger each way than the size of the iron core of the transformer. For the 50-watt transformer previously described the coils are 2¼ inches long and the iron core 1⅛ inches square. Then the mandrel will be 1⅛ inches square and four to five inches long. A ⅝-inch hole is bored through it lengthwise to receive the winding crank. Heavy insulating paper is wraped once around the mandrel, lapped about one inch and the edge glued down. The paper should be one-half to three-fourths inch longer on each end than the coil, which end portions are cut into pointed flaps and folded around the ends of the coil before it is taped. Next, three or four pieces of sheet iron are pushed through under the paper all around until the paper is tight. These are to be pulled out after the coil is wound, to loosen it so that it may be pulled from the mandrel. Then a heavy band wire is wrapped around at each end of the winding space, to wind against. These wires are spaced the proper distance apart for the length of the coil and twisted very tightly so they cannot slip. They, also, will be removed when the coil is finished. The above points are all illustrated in Fig. 3.

Winding the Coil

It is not best to begin winding the coil until all is in readiness, as directed in preceding paragraphs. Then the first layer of wire should be glued to the paper on the mandrel with a waterproof glue, which may be prepared by adding one part boiled linseed oil to eight parts of ordinary glue, stirred together over a low heat to avoid boiling. A small amount of glue may also be used on the end turns as each succeeding layer is wound on. This last is not always necessary, but gluing the first layer to the paper helps much in making the coil rigid, and safe to handle without collapsing, after it is removed from the mandrel, and especially when small wire is used.

To start the first layer, leave enough wire extending outside to reach a terminal post. A loop of tape placed around this terminal wire, to be glued to the paper and wound under the first few turns, will hold the terminal wire securely. Wind the first layer tightly, with the turns very close together. This is important. The manner in which the first layer goes on determines to a large extent the compactness and neatness of the finished coil. It is advisable to stop every four or five turns and drive them up tightly together with a mallet and a square ended stick. If the first layer goes on evenly, succeeding layers can be made even and tight also, but any open spaces left between turns in one layer will allow wires of the next layer to drop in, which condition goes from bad to worse, resulting in a rough coil and disappointment.

The first layer fills the whole winding space from end to end against the heavy band wires, and is glued in place. Each succeeding layer drops back one turn at the ends in pyramid fashion and cannot slip off if wound tightly. The finishing end of the wire is secured by running it through a loop of tape which has been wound under the last few turns of wire. The ends of tape are left protruding, and, after the end of the wire has been run through the loop, it is pulled tight. White, cotton tape is used, and a little glue is put on the loop before drawing it tight. See Fig. 4.

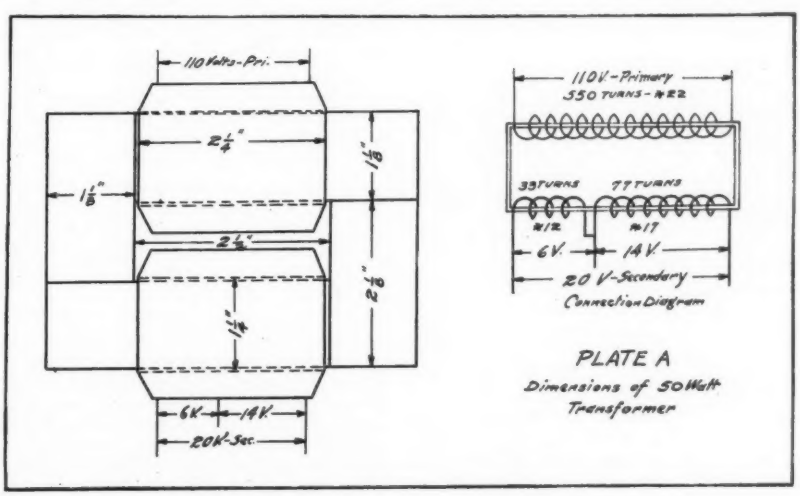


PLATE A. DETAILS OF A SMAL LTRANSFORMER.

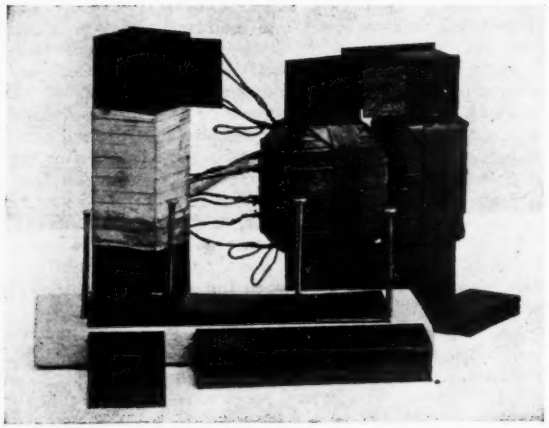


FIG. 3. Stacking and assembling the core. The distance between end nails is sufficient for one side lamination endwise and one end lamination crosswise. Spaces are left for end laminations as sides are stacked alternately to left and right, so that laminations will interleave at all corners. The method of inserting end pieces in a partly finished transformer is shown, also a completed side core, taped, ready to receive the coil.

When a coil is wound for more than one voltage, taps must be brought out. The method of doing this may be seen in Fig. 4. The wire is looped back and tied with twine at the neck of the loop. Succeeding layers are wound past this loop, which is brought straight out. All twisting and splicing is done outside of the coil, care being taken not to allow the twisted portion of the splice to extend down into the coil. To do so often breaks the insulation between turns and causes a short circuit. After the splice is made one side of the loop is cut, and the wire is straightened out to form a long terminal.

Finishing the Coil

After the coil has been removed from the mandrel, and the large band wires are pulled away, the protruding ends of the paper lining are cut into pointed flaps and turned back over the ends of the coil. This protects the coil from becoming grounded against the iron core. Cotton tape is then served on evenly and very tightly, with the ends glued down on the inside of the coil. The tape may be applied over the entire surface of the coil, or only in bands of three turns each, as in Fig. 4. The latter method allows better ventilation than the complete covering. After making all splices and soldering them, they are wrapped with white cotton tape, glued on. Then the whole coil may be painted, or dipped, in shellac or insulating varnish, and dried. Shellac is not recommended for enameled or cotton-enameled wire, as the alcohol dissolves the enamel.

Building the Core

Very good material for the cores of small transformers is No. 27 gauge, black, sheet steel such as is used in making stove pipe, unless regular transformer steel can be obtained. Often the cores of old transformers or motors may be purchased cheaply at a junk yard, which, when well cleaned, serve very well. Never use tinned or galvanized sheet iron for this purpose.

Before being cut into the proper sized pieces for the core, called "laminations," the large sheet should be cleaned of all dirt and oil, then painted with a thin coat of shellac or insulating varnish on both sides. When dry, the steel may be cut with snips or squaring shears; much the better job being done on the squaring shears. It is important that the laminations be cut uniform in size and with straight sides and square corners. The first parts of the core to be stacked are the side legs which extend through the coils. Stacking may be done in a three sided box or in a crib made of large nails driven in a board. Two or three nails should be placed behind the stack to keep it straight, and one at each end to limit its length. The end nails are spaced just far enough apart to allow one side lamination to lie in lengthwise and one end lamination crosswise. The end laminations are not put in while stacking the sides, but spaces are left for them by laying the side laminations alternately against opposite ends of the crib. After enough are stacked to make the necessary thickness when compressed, the stack is removed from the crib and its middle portion is taped after being compressed in a vise or clamp. The method of stacking, and a finished side leg are shown in Fig. 5.

When both side legs have been completed the coils are slipped on to them in such a way that the terminals come out in the proper direction, and then the end laminations are inserted. These are put in one at a time, the first one being placed in a space left for it between the laminations of one side core and just butting up against the other side core. The second piece butts up against the first side core and enters a space in the second side core. The third piece alternates with the second, the fourth with the third, and so on until the whole end is filled in. The corners are made even and square, and the pieces are tapped in tightly so that no air gaps are left at any point. When the opposite end has also been filled, the ends are ready to be compressed very tightly in a vise and cotton tape glued around to hold them securely and prevent humming.

Mounting the Transformer

Several methods are followed in mounting the transformer. A very good way is to put it in a sheet iron box with tight lid. Terminal posts to receive the outside wires are inserted in the sides of the box by bushing the holes with fish paper rolled around the screws, and using fiber washers on each side of the iron so that the terminal posts will not be touching the iron at any point. After placing the transformer in the box and making the terminal connections, a trial run should be made to see that all terminals are properly connected and that there are no short circuits. Then fill the box with dry sand, packed in tightly, and put on the lid. Plaster paris and sand in equal parts, may be used if desired, put in wet, but in this case all moisture must be dried out thoroughly by baking in a low heat, before connecting the transformer again to a source of electricity.

Another method of mounting a transformer is seen in Fig. 1. This is especially good where a number of taps have been brought out from the secondary coil for obtaining different voltages. The binding posts permit of easy change from tap to tap. The face plate is made of slate, such as may be sawed from a piece of broken blackboard. The slate may be painted with a mixture of turpentine and drop black and rubbed before drying. If slate cannot be obtained, a face plate of hardwood, transite or bakelite may be used. Under the transformer, for protection, is a piece of heavy sheet iron, also painted black. The through bolts are pieces of ¼-inch iron or brass rod threaded to receive the nuts. The core is drilled through at the corners in this case, to receive the through bolts, by clamping it tightly between two pieces of bar iron and drilling through the whole thickness. A core of laminations is very difficult to drill without compression.

Still another good method of mounting is shown in Fig. 7, where primary and secondary are both on one leg of the core. The opposite leg is let into a block of wood which forms the base. Primary terminals are arranged on one side and secondary on the other.

Vocational School Obtains Additional Space. Pending the construction of a new building for the Brooklyn (N. Y.) vocational school for boys, the board has leased an additional floor in the Cary Building to allow room for the expansion of the school. It is estimated that the new building cannot be erected in less than three years after the proposal has been approved.

A Job Sheet in Bench Metal for Home Mechanics

F. E. Tustison, The Stout Institute, Menomonie, Wis.

JOB SPECIFICATIONS: To sharpen and adjust a lawn mower.

If the lawn mower is used constantly, it becomes dull. Even the so-called self-sharpening mowers lose their keen cutting edge. Stones, sand, wire, and other materials dull or nick the blades, which decreases the mower's efficiency. The bearings of the reel become worn. Perhaps this one defect causes more trouble than any other. The lawn mower should be inspected and sharpened at least once a year and at shorter intervals after an unusual amount of cutting is done. This can be done at home, a screw driver and monkey wrench being the only tools necessary. In many cases the screw driver alone will suffice.

MATERIAL: Lawn mower, oil, fine grain carborundum.

TOOLS: Monkey wrench, screw driver, mill file.

PROCEDURE:

(1) Lower the stationary cutting blade. The stationary blade is lowered in order to enable any play in the reel to be discovered. This is absolutely necessary in order to properly adjust the reel.

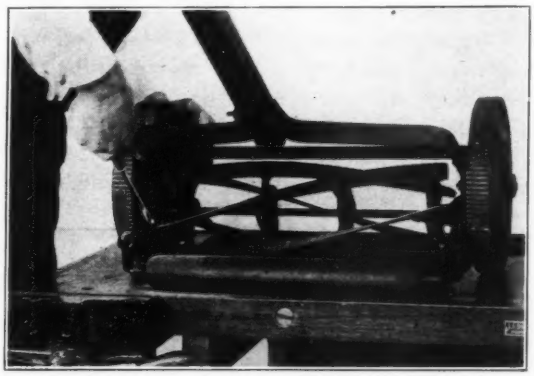


FIG. 1. RAISING THE CUTTING BLADE.

(2) Take up the play in the reel. A mower with absolutely sharp blades will not work properly if there is any up and down play in the reel. This play can be detected by holding the mower firmly with one hand and pushing up and down on the reel with the other hand. The play is removed by loosening the set screw at the end of the reel and turning up the cone by inserting a nail or similar device in the hole of the cone prepared for that purpose. The mechanism here is similar to the cones in the ordinary bicycle. Be sure to adjust until there is no up and down play. The adjustment, also, must be loose enough so that the reel runs freely.

(3) Raise stationary cutting blade to friction. The stationary cutting blade is then raised until it touches the blades on the reel. Do not get it too tight as the grinding compound will increase the friction. It is, perhaps, better to raise the lower blade several times rather than grinding it with one setting.

(4) Reverse the driving pinions. In order to reverse, remove the wheels and exchange the driving pinions. Put the right driving pinion on the left side and the left driving pinion on the right side. You can test for this adjustment by running each wheel backwards and noting if the reel turns backward with it. When the wheel is run forward it should run free of the reel.

(5) Put grinding compound and oil on the stationary blade. Place mower in the upright position so that the stationary cutting blade will hold oil and the grinding compound. With an ordinary teaspoon spread carborundum powder evenly on the lower cutting blade. Cover with ordinary engine or machine oil, and work into a paste. Do not use compounds as a substitue for carborundum. Emery and the like do not possess sufficient rapid cutting power.

FIG. 2. REVERSING THE DRIVING PINION.

(6) Turn mower upside down and push forward. When you turn the mower upside and push forward you may experience a little difficulty in getting the reel started. A little pressure by someone else on the mower, as you push, may help.

(7) Grind until the reel runs clear. Keep the mower moving until the reel runs clear. By running clear it is understood that, should you stop the mower instantly, the mower will spin on for several seconds.

(8) Test cutting power by cutting tissue paper under every blade for its entire length. In this testing be sure to test all places between the knives of the reel and the stationary cutting blade. If many places are found where the tissue paper moves between the two blades, the stationary cutting blade must be raised and the grinding operation repeated.

(9) Regrind and retest. Grind until the mower is sharp at all places. During the last grinding be sure that the reel runs absolutely clear.

(10) File ends of blades on the reel so that they do not click. During the grinding the ends of the blades on the reel are not likely to be ground as low as the other points. When the reel is turned forward this point of the blade comes in contact with the stationary blade and may strike. This can be remedied by filing the ends of the blade to a bevel.

(11) Clean the machine. It is absolutely necessary that all the grinding compound be removed from the mower. Clean thoroughly the stationary cutting blade and reel.

(12) Replace driving pinions in the original position, cleaning and oiling them. When the pinions are reversed and the mower is reaping or cutting, test by pushing forward at ordinary speed. If by chance there is too much friction between the reel and the stationary blade, adjust slightly by lowering the stationary blade. A slight adjustment here takes extreme care and should not be recommended to the amateur who has not done it before.

Questions

(1) What arrangement is on your mower to raise and lower the stationary cutting blade?

(2) Can you sharpen a mower with a file? Why?

(3) Why use carborundum in grinding?

(4) Why are the blades on the reel curved?

(5) Give a good rule stating when a mower should be oiled.

(6) If a pawl was lost or worn out, could you file one from a piece of steel?

(7) What is the object of a ball bearing mower?

BRUCE-MILWAUKEE

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

WHY AND HOW?

Pupils and teachers alike demand definite recipes by which their conduct is governed.

The juvenile question Why? is too soon replaced by the dictatorial How?

A multitude of tasks confront us. We yield to the inevitable. Our concern is to do the chores and be done with them. We demand practical and absolute dictation. We expect to be told How?

From a synopsis of Educational Demands to be placed on the Manual Arts, taken from a discussion of several years ago we quote the following:

"Manual Arts of the future will be a motor mental process with as much emphasis on the mental as on the motor."

"The intellectual element—too often obscured by emphasis upon the doing—will be a prominent consideration in future manual arts planning."

"We will emphasize the why as well as the how in future manual arts."

We judge from the constant demand for exact methods and procedure on the part of teachers that the above statements still apply to the future.

No series of set exercises which constitute a course in the school program, explained and dictated as to exact method of execution, will be worth while as an educational process.

Even a vocational course is not satisfied by this recipe.

We must conduct our school work with the theoretical Why? as a constant incentive to original thought.

A CONFESSION

A letter from The American Crayon Company, addressed to Art Educators of America begins with two questions: "A Program of Art Education with Content Value for American Schools—What shall it be? Can not common ground be found on which all factions can stand?"

To the first of these questions we are inclined to decline. To the second we are inclined to reply in the light of history with a sorrowful, No.

We decline to give a definite Program of Art Education for American Schools because we refuse to have our pet program garbled by teachers who do not recognize the excellence of it. We have perfect faith in this program of ours. We are convinced that we could make artists of all intelligent pupils who followed our program. If they are not artists after using our program it must be their own fault. The program is above reproach.

We refuse to put this program on the market much as we need the money. It would seem to us like selling our birthright. We have been devising it ever since we became interested in Art Education. We have tried it on many unsuspecting subjects with only fair success. Most of them must have been stupid.

The principal reason we keep this program to ourselves is because it is not designed to fit into the American schools at present.

It is designed to *replace them.*

We answer the second question in the negative because we have found ground on which all factions should stand but they *would not* stand on it. Artists are a stubborn lot. They even expect us to stand on their ground which is not artistic at all.

We are very sorry for the teachers of other school subjects who must spend their lives imparting "Content Value," whatever that is, according to a standardized course of study.

It just occurs to us that perhaps the reason art teachers cannot agree on what and how and when to teach is that they are as set in their notions as we are. These art teachers are a queer lot.

ECONOMY AND THE INDUSTRIAL ARTS

The economy wave is still advancing. It is perfectly proper that vigorous measures be adopted to check the lavish expenditures of the public money. It certainly is time for such tax reduction as will lighten the present burdens of taxation. But when the economy wave strikes a community, too frequently the retrenchment begins with those essential and vital institutions like the public schools.

When a policy of retrenchment has been adopted for the public schools, a kind of cursory evaluation is made of the various kinds of school work and a comparative table of costs is constructed. Each subject is called upon to restate its claims to a place in the curriculum and to rejustify its quota of the expenditure.

Naturally the industrial arts and kindred subjects cannot escape this general revaluation. Where costs are figured on the hour-student basis, it is generally shown that the shop subjects are the most expensive ones. This means that in a good many places, especially where the administrators and academic teachers are a bit unfriendly to the industrial work, rather vigorous assaults are to be expected upon industrial arts, home economics, and vocational work.

Teachers of industrial arts and kindred work are facing and will continue to face the ever-recurring questions, "What is the purpose, or aim, of your work; what are you driving at; to what extent thus far have the results satisfied such purpose or met such aim; has your work made good?" Teachers are being asked and will

continue to be asked to show cause why their work should not be either reduced in amount and cost, or abandoned altogether.

These questions and this challenge should be *welcomed* by the intelligent, wide-awake, progressive teacher, who should use them to justify his work and to further its cause. It is altogether probable that in communities where the shop teachers are of this character, very little fear is felt that their work will suffer disproportionately at the hands of those who must prepare the budgets and do the retrenching.

A sane, up-to-date, progressive system of industrial arts in the hands of thoroughly educated teachers is in but little danger of permanent injury from economy waves. As a matter of fact, it should be, and probably will be, one of the very last subjects to be abandoned or seriously hampered by policies of retrenchment.

The kind of work that *will* suffer and *should* suffer during periods of stringency and retrenchment is the old-fashioned manual training that has not kept pace with the modern movement of things in education and industry.

The American people are not so much disposed to ask *what a thing costs* as they are to ask *whether it is worth what it costs*. They are able and willing to pay the price for anything that they think *really functions* in making their children happier, better informed concerning the work of the world, and more able to take care of themselves under the varying conditions of modern life. These are the very things industrial arts courses actually do.

A competent supervisor and corps of teachers cannot fail in the long run to convince their community that the shop courses which they teach provide a vital and fundamental element in education which every child should have, and that they are *worth what they cost*.

BUYING TOOLS

One of the most important duties in connection with the industrial arts work is the selection and purchase of tools and equipment. With prices yet high and with the cry for economy coming from every quarter, the problem of providing adequate and efficient shop equipment becomes increasingly difficult.

In such circumstances, it is sometimes hard to resist the temptation to resort to the poor economy of buying cheap, inferior tools. This is indeed poor economy both in length and in quality of service. It is a pretty good rule that in shop equipment, as in other things, economy lies in the *quality* of the article and not in the cost of it.

If it becomes a choice between fewer tools and inferior tools, in most cases wisdom lies on the side of fewer tools of good quality instead of many tools of poor quality. By a reorganization of the work and by the proper modification of the courses of study, often a very limited equipment of superior tools may be made to serve the purposes of the work until the necessary additions can be made to the equipment. In this way, there is no loss. Whereas with the inferior tools, it means inferior work and rather soon a new equipment; which means great loss and bad results.

While there is not always great importance to be attached to age and to a name, nevertheless, in the field of mechanical tools, some brands have become standard. Safety lies in the purchase of articles that have stood the test of time and experience and that are backed by the guarantee of absolutely reliable manufacturers and dealers.

WHO PAYS THE COST OF APPRENTICESHIP?

This question is asked in a recent number of the Wisconsin Apprentice, and made the basis of a discussion which indicates that employers are not entirely clear as to the answers here to be given. A master builder asks: "Who is to reimburse me for paying my apprentice while attending school part time? Surely, I can't ask my customers to bear the cost."

The counter question might be asked: "Who paid for the apprentice's time under the old system, the employer, the consumer, or the apprentice?" The last mentioned may have paid something for the privilege of learning a trade in accepting a nominal wage but whatever the employer paid was charged to the cost of production. In other words the consumer paid.

After the state has afforded the facilities for trade training, built the school, and provided teachers, it can hardly be expected that it reimburse the employer for the time his apprentice spends at school. The assumption must be that the wage paid the apprentice is based upon the value of the service received. The employer must recruit the ranks of skilled workers if he is to remain in business. The industry must absorb the cost.

There was a time when the apprentice served for a mere nominal consideration in order to acquire a trade. The employer as well as the consumer were, under that system, relieved from bearing the cost of training. The burden fell upon the apprentice. But, under the new order of things the situation is materially changed. The public now assumes the burden in the way of taxation for vocational schools and in the added cost placed upon production. All this is the result of an industrial evolution in which the law of supply and demand, as it always has, asserts itself. The apprentice can no longer be obtained without a wage consideration.

Education has most opportunely stepped in to serve industry in the recruiting of its skilled forces. Thus, society pays a large fraction of the cost for training apprentices in taxation and the balance in an increased cost on the price of commodities.

The apprentice is rendered self-sustaining during the process of trade training. He receives, in the acquirement of skill, something valuable to himself and in a monetary consideration which has an equivalent value for the employer. The modern apprentice pays less than the old time apprentice; the ultimate consumer pays more.

A Six-Wheel Bungalow

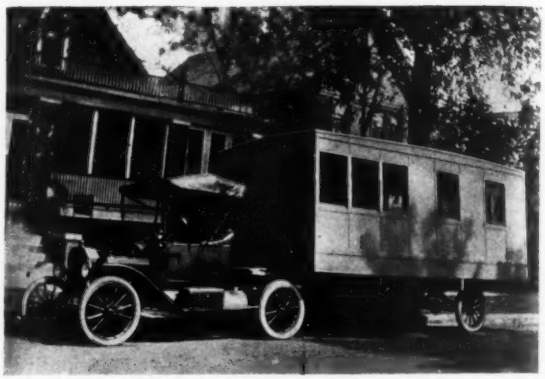
Chas. P. Burnham, Teacher of Auto Mechanics, Englewood High School, Chicago, Illinois

The pleasures of the wandering life have appealed to most people at some time or other in their lives; but the inconveniences and discomforts that have, heretofore, been inseparable from camping out have kept all but a very few from enjoying these pleasures. These disadvantages, however, need no longer keep anyone from indulging his inclination to rove. The auto-camping outfit, the house on wheels, has come to relieve him. With it the wanderer can enjoy the comforts of the city apartment with the pleasures of the free life of the out-of-doors.

Many have such outfits; some build houses on chasses of trucks and enjoy their summers using them; others build trailers and consider themselves the "most blessedest" amongst auto campers; some build bungalows that can be placed where regular autobodies are supposed to be. All these outfits have their good as well as their bad qualities. Their owners also have their rewards. We have no quarrel with them. But we prefer our own outfit, a six-wheel bungalow on wheels.

Our house is not the hastily planned contraption of the fellow who gets his camp lore from reading the auto page of the Sunday newspaper. It is not a toy. It is a practical outfit made by an experienced auto gipsy. My wife and I have been outdoor fans since we were children. Camping has been our special form of outdoor life. We have camped with the ripples of the Pacific surf lulling us to sleep and we have pitched our tents amongst the pines on the summits of the Rockies. We have watched the sunset in the deserts of Arizona and have eaten our evening meal in the Grand Canyon of Colorado. The shores of the great lakes are as familiar to us as is our own home. We know the banks of the Mississippi better than we know the streets of the loop. We have camped "among the pines of Vermont"; we have seen "the breaking waves dash high on a stern and rockbound coast" of New England.

On our camping trips we have used many forms of conveyances. Canoes have carried our camping materials; wagons have served us and served us well; our automobile loaded to capacity with tents, stoves, cots, mattresses and blankets afforded us a pleasant camping trip. An auto-trailer carried us on a winter long camping tour to the Pacific coast and back; we got a great deal of pleasure out of all these trips. But the enjoyment was not unmixed with discomfort. Every morning I spent an hour breaking camp; every night I spent an hour making it again. There is no successful way of cooking, serving, and cleaning away a meal in a tent. From two in the afternoon until we finally settled down for the night the mental energies of the entire group had to be taken up with searching for a place suitable for a camp. It is seldom that a place suited for pitching a tent affords any of those pleasant views of the world which one wants to see. There is no pleasure in tenting through a rainy day in a tent with an earth floor; there is no way to successfully pack up a camp on a rainy morning. We tried it many times and have no pleasant memories of the occasions. On the whole our experience taught us that a camping outfit, which requires making and breaking camp, is far from the best camping equipment for the wanderer.



"READY—LET'S GO!"

We wanted something more substantial than a tent over us and something more even than the earth under us. We wanted a camp that would be as movable as an Arab tent, as substantial as a suburban bungalow, as convenient as a city kitchenette apartment, as light and airy as a Japanese bamboo cottage, as comfortable as an old-fashioned farm-house, but cheap enough for a school-teacher to enjoy. We brought to our task, as I said before, the experience of years of camping, the enthusiasm

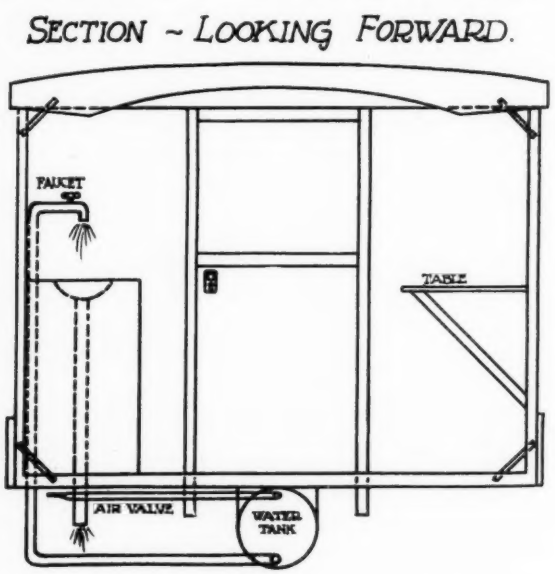


FIGURE 1.

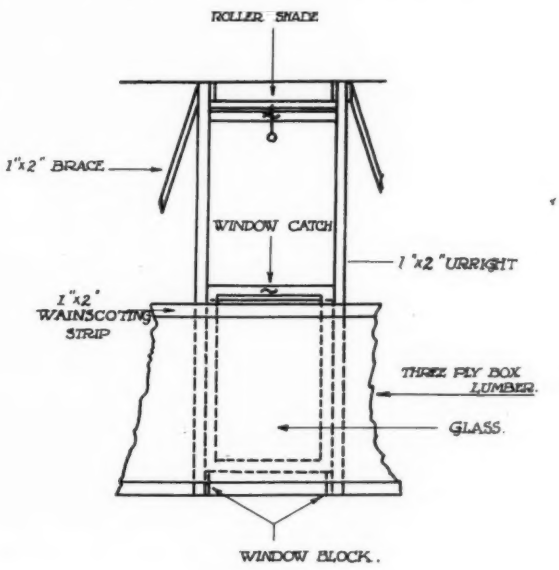


FIGURE 2.

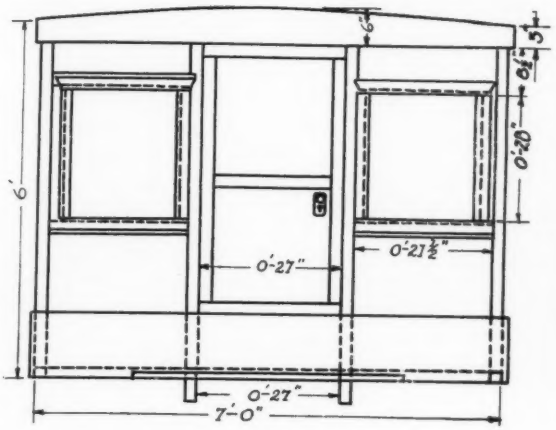
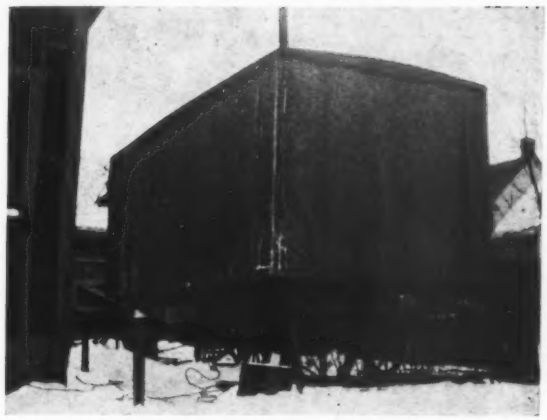


FIGURE 3.



"YES, WE PAY NO GARAGE RENT."

of lovers of the outdoor life, a modicum of mechanical skill and a little common sense. Our bungalow on wheels, made according to the following description, gave us all the things that we asked for and many more besides. For us there is no other outfit that will do.

The writer is a Ford fan. The illustrations will show you that the outfit is mounted on one of Henry's best. We began by removing the rear fenders and the top of our Ford touring car. By cutting the body of the car through the frame just back of the front seat, the rear half of the body comes off but in such a manner that a piece of angle iron bolted below the sill and a piece of flat steel above permits it to be restored to its place and be just as rigid as if it had never been removed. A Ford roadster top protects the driver while on the road. A discarded turntable or "fifth-wheel," secured in a wagon shop, serves as a fifth-wheel for our tractor at a cost far below that of any of the numerous fifth-wheels for Fords now on the market.

A Ford rear axle with its spring carries the rear end of our bungalow. A glance at the drawings will give the reader a good idea of the construction of the frame work of the house.

Furnishing the house gave us as many thrills and as much enjoyment as furnishing the flat gives newlyweds. We studied to secure a maximum of comfort with the greatest economy of space. We had learned by bitter experience that comfortable sleeping equipment is the *sine qua non* of happy camping. Georgeous sunsets are not georgeous, distant mountains lose their azure hue and views lose their enchantment, rustling leaves become rumbling rubbish, babbling brooks become howling mobs, whispering woods become whimpering wastes and alluring sights cease to allure when the campers' bones are aching from the stones that served as pillows the night before. Well, we got the best full-sized coil spring we could find and a mattress of similar quality. We fixed the spring rigidly across the rear end of our bungalow. In the space left at the foot end we built a locker for our camp chairs. Above this we built a closet for clothes. A porch swing with casters to trundle under our bed served as a comfortable sleeping place for our little girl. Curtained off on one side of the house we built a toilet.

The bedrooms furnished, we turned our attention to the kitchen. Along one side of the house we built a zinc topped cupboard. At one end of this we installed a regular kitchen sink; on the other end we made a flat top for our "Kamp Koop" gasoline stove. Below the sink and under the stove-table is ample cupboard space for storing food, dishes and cooking utensils. Water is supplied to the kitchen and toilet by a thirty gallon tank suspended under the floor of the house; pressure is supplied by air. The "free air" stations keep us supplied with air for the tank as well as the tires; a hand pump does the trick when we are away from the garages.

No house is complete without a dining-room. We have one. Ours is usable. The table is hinged to the side of the house and swings out of the way when it is

PLAN OF TRAILER.

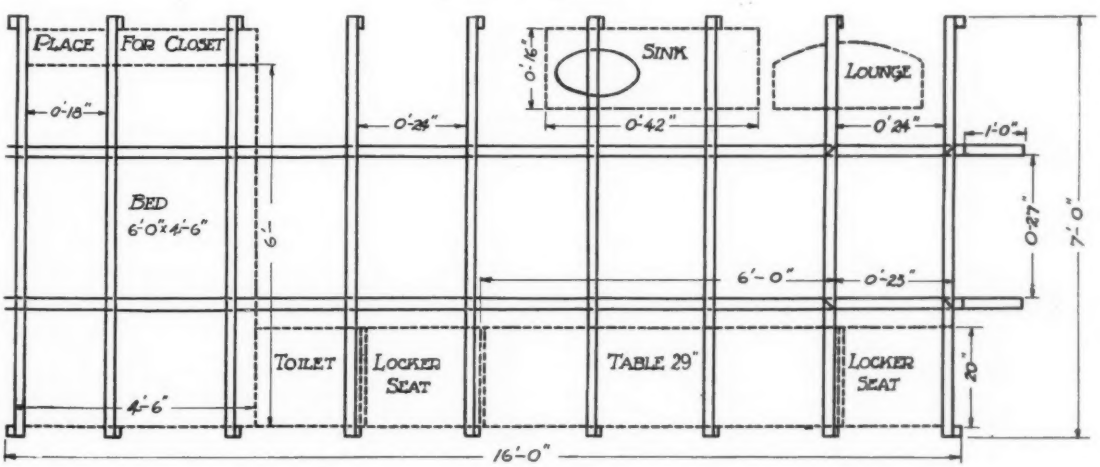


FIGURE 4.

OUR BED ROOM.

OUR DINING ROOM.

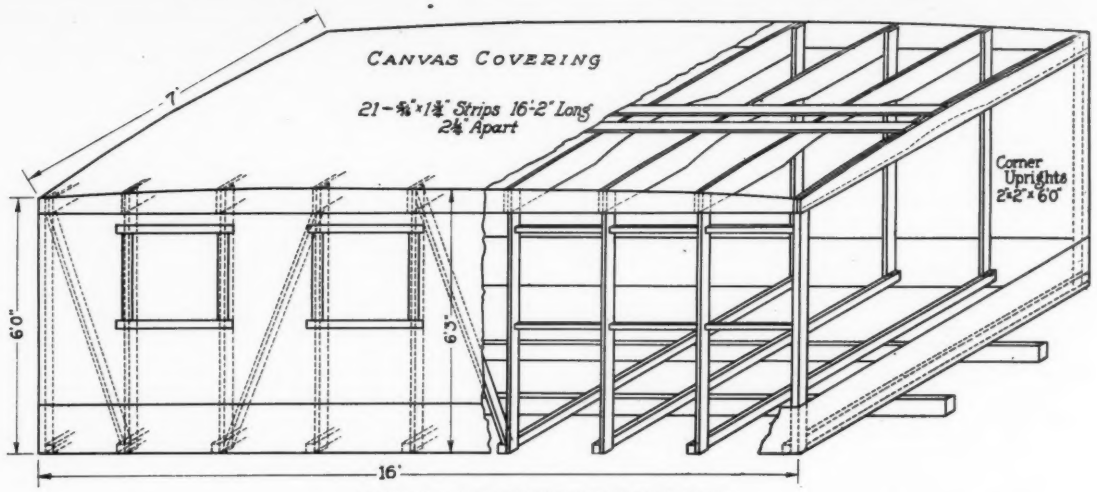


FIGURE 5. THE FRAME OF THE TRAILER.

not in use. At both ends of this are lockers which answer the purpose of seats. The tops are upholstered in harmony with the color scheme of the house.

A lounge made from the front seat of an old touring car in such a way that it can be stored away while in camp and screwed fast while we are traveling completes the furniture of our bungalow.

We covered the floor with congoleum. Dark oak makes a pleasing color for the lower part of the walls and light oak does the same for the upper part. Olive green window shades and upholstering of the same color make a restful color scheme for the bright light of the day and a pleasant color for light from the tiny electric bulbs that serve us at night. These bulbs are supplied from an extra battery carried beneath the floor of the car. This battery is recharged by being connected parallel with the system of the tractor. Its advantages are greatest when the bungalow and the tractor are detached.

Any auto tourist knows that an outfit cannot have too many brakes. Our tractor has them; our bungalow has them also. The trailer wheels are fitted with external contracting brakes. These brakes are controlled from the driver's seat by means of a cable.

Thus our tractor-bungalow is completed. "But will it work?" skeptically asked my associates while I was building it. I answered that it would. The results have much more than justified my confidence. We can travel 25 miles an hour over fair roads and twenty miles an hour over almost any passable road. This is fast enough to suit us. Who wants speed on a camping trip anyway? If that is all one wants why not go to Indianapolis or the beach in Florida?

By means of one of the numerous "extra transmissions" that may now be bought for Ford cars, this tractor can pull the bungalow through any sand or over any hill that is likely to be found on any main traveled way of this country. We left a generous "over hang" in the rear and put the fifth wheel of the bungalow as far back as we could. We thus made a car that can be backed and turned in a smaller space than a truck of the same length. In traffic it operates just like any ordinary Ford.

In camp it is superb. There is nothing with which to compare it; it is in its own class. Stop the car and get a pail of fresh water for drinking purposes and we are ready for the night. Rain doesn't worry us for we have a substantial roof over our heads, a good floor under our feet, an abundance of food, places to lounge and recline, electric lights, in short, all the comforts of home. Flies and mosquitoes take one look at us; we must be good to eat, we look so comfortable, but they go and seek their suppers on some one who is camping in a tent. Cold days do not disturb us; we close the windows and light the stove. Next summer we are going to install our radio in our summer residence. Two convenient trees will let us string up our aerial and fifteen minutes after we land in camp, we will know what KYW is telling the world.

On the road the comforts are as great as they are in camp. The ever ready bed is just as comfortable by day as by night. The lounge is the most comfortable place to sit that the writer has ever found. His wife and little daughter spent several weeks in this seat; when the driver was able to induce some one else to drive he too occupied the lounge.

The six-wheeled outfit rides surprisingly easy—in fact easier than any touring car—and has the advantage of being able to leave the camp house at any site while using the tractor to get supplies, to view the parks or to explore the surrounding country. Do you wonder we have named it "We-Like-It?"

Auto Mechanics in the High School

II — How Can We Start?

Lewis H. Wood, Sioux City, Ia.

There are several reasons why the study of auto mechanics has not been more generally introduced into our high schools. Probably the first reason that would be given by most school officials is that every inch of space in our buildings is filled to overflowing now, and, therefore, it is impossible to find the necessary space for the new subject. The overcrowding of our schools is very real, but when a man gives as the reason that he cannot find room for auto mechanics it probably means primarily, that he has not yet been convinced as to the desirability of the study. It also probably means that he has, somehow or other, gotten the idea that this work will necessitate a lot of expense for equipment and supplies. Therefore, as he is hard pressed to make the budget go around anyway, he sidesteps any mention of auto mechanics with the excuse that he cannot find the space for it.

In some places it is the inability to find a suitable teacher that prevents the work from being introduced. There is a lack of competent teachers for this work. The demand has been so recent and so insistent that we have not been able to get men enough into our training classes, nor to properly train those who have entered. Then, too, the teachers who do go out, unless they are especially strong, are handicapped by the lack of suitable textbooks and materials for use in general high school classes. There are many excellent books dealing with the automobile but almost all of them are very technical and approach the subject from the viewpoint of the mechanic, and not that of the owner and driver. Books such as these are just the thing in the strictly vocational or trade class and are excellent as reference texts and for the more mechanically inclined boys, but do not seem suitable as texts for the students of the regular high school auto class.

There are other considerations which may hinder this work in particular localities, but the above objections will explain why auto mechanics is not taught in many schools.

Now to make this discussion worth while, these objections must be considered separately and if possible means found of overcoming them. First, let us consider the question of popular demand for the introduction of this work, or the selling of the idea to our school officials and the community. If the demand is strong enough the other objections will be overcome without much trouble.

Woodwork and drawing came into our schools at a time when we wanted something new, and they were seized upon and pushed by the school people themselves. However, most of the newer shop activities have been largely promoted by outside influences. Consider the publicity given forge-shop and sheet-metal work by the manufacturers of supplies and equipment for such work. Read the full page advertisements showing the advantages of printing in the public schools. Think back over the years that the Portland Cement Association has literally flooded the country with pleas for the introduction, into our schools, of courses dealing with concrete. No one has objected to this. We have felt that, while the interest of these outside organizations was selfish, yet they were helping us to expand the usefulness of our public education.

Now there is no organization interested in boosting auto mechanics in the schools. Even the school people themselves are more or less apathetic, for they are more than busy with all they have to do now. Therefore, it becomes necessary for the manual training and vocational people to sell the idea not only to the public but primarily to the school authorities. This can be done, and in view of the large number of people who may benefit from such course, should be done even at the expense of some of our other shop activities. Once get the work started and it will take care of itself. As soon as the public knows what we can do, they will not let us stop.

On the question of cost we must admit at once that the teacher and room cost, for the number of pupils reached, will in the majority of cases run higher than for other shop activities. This part of the cost is not, however, usually objected to, but rather the supposed cost of equipment and supplies. Unless our school is giving specific trade training in the various branches of auto mechanics, the cost of equipment and supplies need not run high. In fact, in the general high school which presents this work largely from the standpoint of the owner and driver, the tool and supply cost need not be as high as in other shop activities while the immediate worth-whileness of the work will be greater.

A good deal of patience and tact together with time taken to get acquainted with the automobile dealers in a community will usually enable a teacher to pick up all the cars that he will need in the school shop for little or no money. These cars can then be dismantled and different types of axles, springs, steering gears, etc., mounted about the shop. Engines that are not in good condition to run can be mounted for piston, bearing, and valve work, while a few that are in fair condition can be mounted so that they may be wired up and run. Also if there is room, two or three complete cars with bodies removed should be left that they may be completely torn down and reassembled. These old cars with from $100 to $300 worth of hand tools will enable any school to give at least a one-year course that will really teach the boys to appreciate and care for an automobile. Very few other shops can be equipped so cheaply.

The question of space is very important, but usually when something is wanted badly enough the space is forthcoming. Almost any space that may be heated and that has a door wide enough to admit a car will do for a start. The end of a ground floor corridor, a store room, a part of the engine room, or a coal room, a shed or rented quarters near the school will do. Size is not so important. Once get an automobile inside and the auto mechanics class started and the necessary space to meet the popular demand will be found somewhere.

From the standpoint of the man in the school system responsible for seeing that the industrial work is done right, the matter of getting the auto-mechanics teacher is the big problem. A man who is to teach auto mechanics in the general high school must be not only a teacher but also an expert auto-repair man. In almost any of our ordinary industrial training lines a man may study his subject in school for a few years and then, although he is by no means an expert workman, go out and teach. The normal schools have been attempting to train the teacher of auto mechanics in the same way, but usually the results are not very satisfactory. The schools can give a man the theory and a certain number of practical jobs, but he cannot become an all-around auto mechanic without spending a year or more actually in the trade. We must do at least some actual repair work in our school shops, and the teacher must be able to turn out a job that is just as good or a little better than the work done in our best garages. A young man who has only become acquainted with the inside of an automobile through work in a normal school cannot do this, and even though he may be an excellent teacher, yet our shop cannot be a success unless the teacher has the respect of the mechanics in our commercial garages.

Either an auto mechanic with a fair education and some teacher-training, or a shop teacher who has had experience in several garages, makes the ideal teacher, but such men are very hard to find. Probably the auto mechanic, especially if he has decided to make teaching his life work and is willing to learn, will make the best man. This is because the trained shop teacher ordinarily will not take time enough to become a thorough mechanic

before he wants to get back to the schools. A good way to get started is to have two men, one a teacher who will do the class work and one an expert mechanic who will act as the teacher's assistant. After a year or two of this sort of work, the mechanic, if in the mean time he has been studying, can be trusted to take entire charge of the auto shop.

The problem of books will soon be met, as such books are always forthcoming when the demand becomes insistent. Until such time the teacher will have to prepare his lessons by drawing on his own experience and the books already on the market. If such lessons are worked out by the mechanic teacher and then gone over with a supervisor or principal who are not auto mechanics so that the technicalities may be eliminated, the work can be suitably presented.

Altogether the difficulties in the way of getting this work started in almost any high school are not insurmountable. Our first job is to sell the idea to our school officials. Then having received permission to start the work, we must put our best into it and use to the best advantage the space and equipment provided. If this is done auto mechanics, in a very short time, will find its place in our school and community through its own worth-whileness to everyone.

ANNOUNCE CERTIFICATION PROGRAM FOR RECOGNIZING EXPERT CRAFTSMANSHIP

Recognizing the character and long-established good name which Philadelphia has acquired as the city of homes and workshops—a reputation in which its architects, engineers, builders, construction workers and others have participated, the Philadelphia Building Congress has cooperated with other bodies in encouraging an appreciation of good craftsmen. The Congress has conducted a broad survey of construction activities and personnel in order to obtain the names and addresses of all field workers in the building industry, as distinguished from shop workers; the names and addresses of all builders, subcontractors or other employers who encourage such workers and afford them opportunities to do their best or to improve themselves; the names and addresses of all architects and engineers who encourage their coworkers in the service of owners and the community to become better craftsmen or workers.

The Congress will cause to be issued on January 1, 1925, engrossed certificates to be endorsed by the officers and properly qualified committees, as follows:

Craftsman. Those now designated by various names such as mechanics, artisans, skilled workers, who in any building craft have shown skill, ability, efficiency, willingness and the desire to improve their knowledge and technique as well as that of fellow workers, helpers or apprentices—a certificate as a craftsman.

Assistant Craftsman. Those now designated as improvers, helpers, who give indication of the proper qualifications and the desire to become craftsmen, or to those who are satisfactorily completing terms of apprenticeship, and have shown the characteristics described in the preceding paragraph—a certificate as an assistant craftsman.

Junior Craftsman. Those now designated as apprentice, learner, who after satisfactory completion of such terms as shall be deemed sufficient, indicate the characteristics described in the first paragraph—a certificate as a junior craftsman.

Guildsman. Those now engaged in any of the crafts, who have shown especial skill in developing the artistry or handicraft possibilities in their particular field of work, such as designing, laying off, modeling, carving, wrought work, and have given visible evidences of individuality—a certificate as a guildsman.

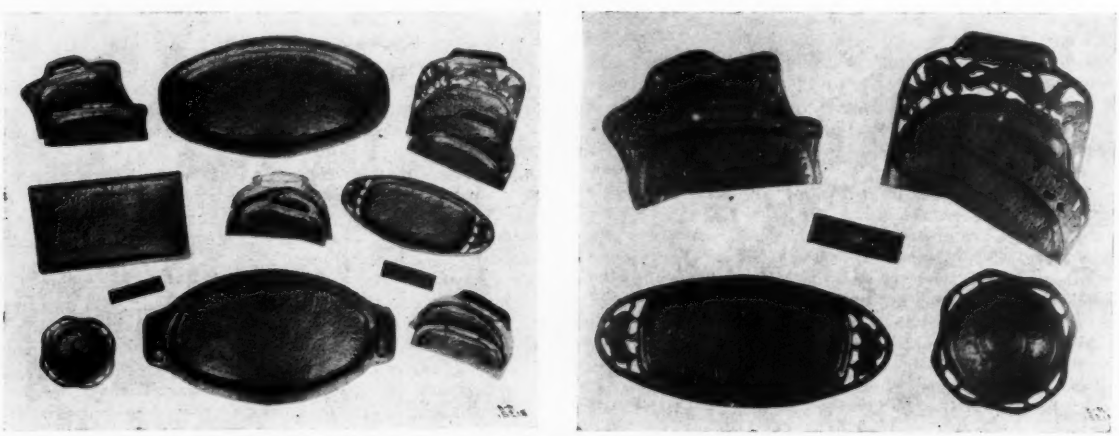
Architects and Engineers. Those who have designed, specified and supervised buildings which have been successfully erected, who have shown knowledge of appropriateness of design with the most advantageous use of materials, who have encouraged pride of craft on the part of coworkers and have given individual recognition of it when deserved—a certificate as a master craftsman.

Builders and Subcontractors. Those who have satisfactorily erected buildings or other structures or parts thereof, or installed equipment therein, and have encouraged pride of craft on the part of coworkers and have given individual recognition of it when deserved—a certificate as a cooperating master craftsman.

Workmen. Those now designated as common laborers, unskilled laborers, or helpers, who have shown aptitude, efficiency, willingness and the desire to successfully perform their allotted task with better understanding of its relation to the work of others—a certificate as a construction workman.

The award of the certificates is to be made upon knowledge of ascertainable facts, as soon as possible after the end of the current year. Awards will be made in each class, upon evidence of sufficient merit and in an individual capacity without regard to whether or not the recipient is affiliated with any organization, association or group. Each certificate is to be non-transferable and is to be superseded by another certificate, if the recipient is considered to be again entitled to a second certificate, either in the same or in another class.

The Philadelphia Building Congress which was established in 1922, is affiliated with the American Construction Council and the National Congress of Building and Construction Industries. The object of the Congress is to enable the building and construction industry to promote the general welfare (1) by discovering through scientific surveys, the needs of the public and of the industry; (2) by finding and recommending ways and means of satisfying those needs; (3) by defining group functions and harmonizing group activities through the formulation of codes of ethics and of practice for the industry, and by other means agreeable to and in the interest of the public and the industry and conformable to law.



ARTICLES OF BRITANNIA WARE DESIGNED AND MADE BY STUDENTS OF MISS RACHEL SKINNER, DIRECTOR OF ART IN THE RIVERSIDE HIGH SCHOOL, MILWAUKEE, WIS.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taboreta, towel holders, etc., which have been made from time immemorial, ad nauseum.

MANTEL CLOCK (See Drawing Page 316).

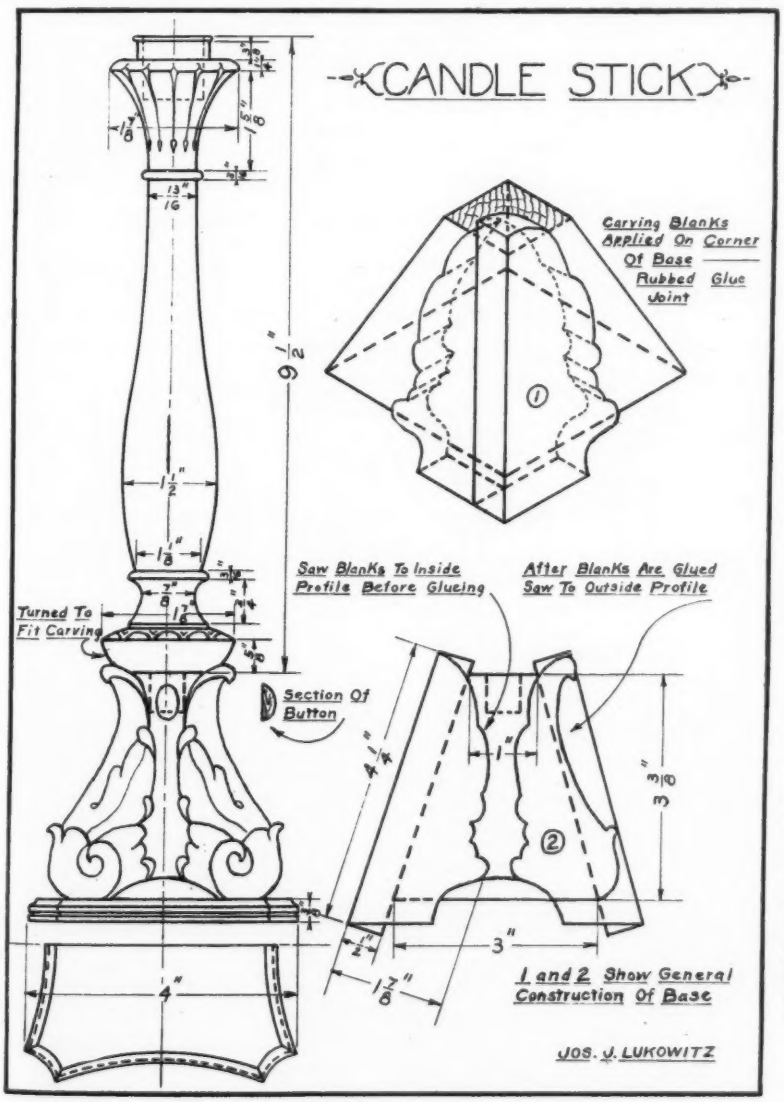
A CARVED CANDLE-STICK AND AN INLAID CLOCK

I. N. Madsen

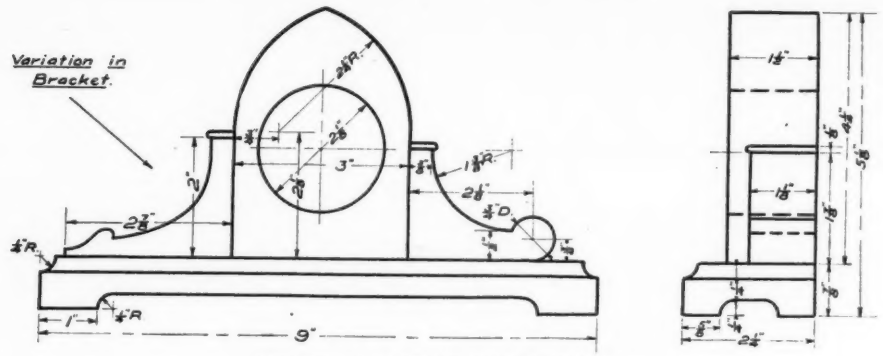
The problems illustrated in the accompanying engravings were made during the second semester of the past school year by senior students in the Manual Arts Department of the Milwaukee Normal School. In each case, black walnut was the material used.

The candle-stick was made in three parts. The shaft was turned and carved. The foot was made of four pieces glued to a soft wood core. The detail drawing indicates clearly the construction. In the photograph the copper candle support has been slightly tilted to make its presence apparent.

The inlaid clock was designed to occupy space on a mantel. It is made of three pieces of walnut and inlaid with box wood. The entire design was worked out in connection with a clock purchased by the student.


CANDLE STICK
Carving Blanks Applied On Corner Of Base Rubbed Glue Joint
Saw Blanks To Inside Profile Before Glueing
After Blanks Are Glued Saw To Outside Profile
Turned To Fit Carving
Section Of Button
1 and 2 Show General Construction Of Base
JOS. J. LUKOWITZ

CANDLE-STICK DESIGNED BY JOS. J. LUKOWITZ, STUDENT AT MILWAUKEE NORMAL SCHOOL.



DETAILS OF AN INLAID MANTEL CLOCK.

CROSS-LAP FLOWER POT STANDS

G. Oliver Schade, Beloit, Wis.

For many years the cross-lap joint has been taught in some form or other such as in windmills, taborets, and sometimes just as a joint.

It is surprising the difference a top makes in appearance, it also makes a stronger appeal to the boys and helps hold their interest. They also make a very convenient, good-looking and practical stand to put under a flower pot.

In presenting this problem give the boys their choice after an explanation that "No. 1" goes very nicely with a pedestal, or taboret with straight lines, while "No. 2" should be used if the pedestal, or taboret has curved lines, and "No. 3" as a rule matches anything that has a round top.

To put the concave bevel on "No. 2" plane a straight bevel first, to take off the sharp corner; then use a small round file which is set in a block of wood as shown in the sketch. This makes a good project in either the seventh, or eighth grade. A small project like this can be made very economically as most of the pieces can be taken from the scrap box.

From my experience it is a poor plan to put shellac, or wax on the stand. It is bound to become damp at times from the flower pot which turns it white. Therefore use no shellac, even as an under coating, but put on two or three coats of varnish; if desired give it an oil rub.

Do not glue felt on to the feet of the stand because they will soon come off, and the glue that is left will scratch the surface upon which the stand is set. It is best to use small rubber tacks for this purpose.

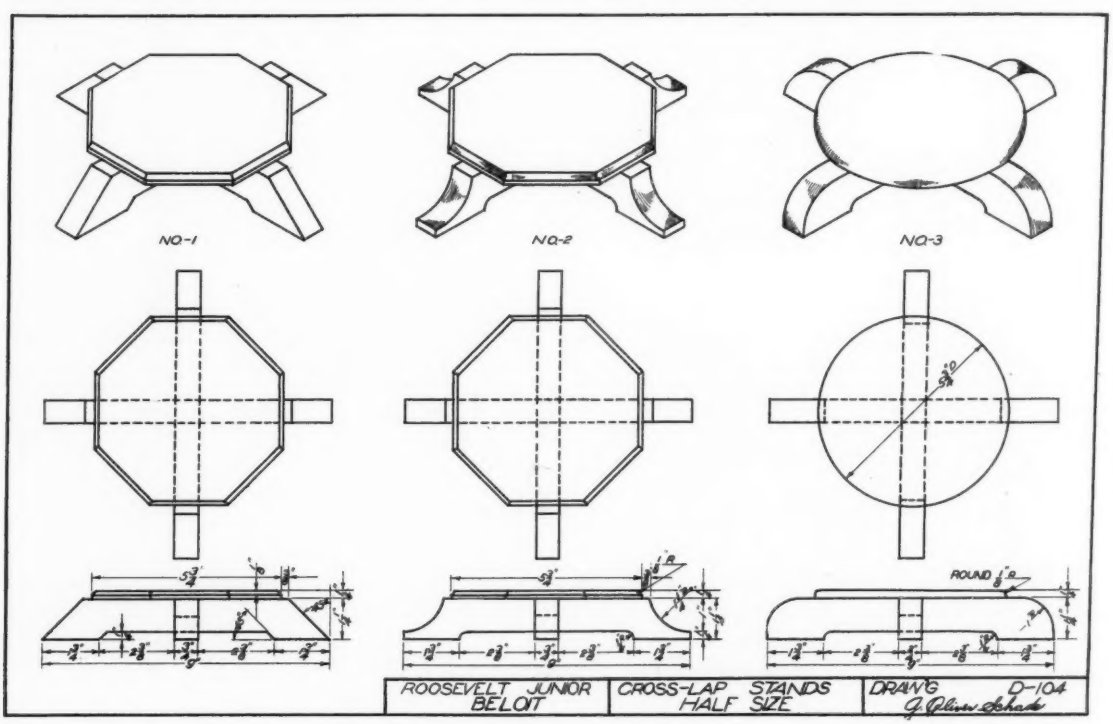
The best way for the boys to fasten the top is to use four ¾" brads, setting the brads and filling the holes up with colored putty.

There are other designs that can be worked out very satisfactorily. A round top works out very good on any of the above designs. Give this problem a chance to work for you, and I feel sure that you will be surprised with the results.

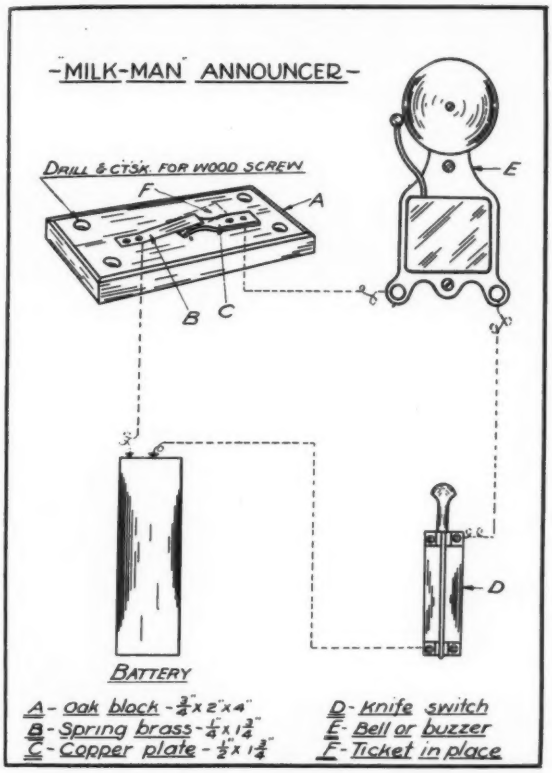
"MILK-MAN" ANNOUNCER

Andrew J. Faber, Haledon, N. J.

The busy housewife cannot afford time to continually watch for the arrival of the "milk-man" when a purchase of tickets is necessary. Consequently, a younger member



DETAILS OF AN INLAID FLOWER POT.



DETAILS OF A "MILK-MAN" ANNOUNCER.

of the family is usually delegated to keep vigil. When this is impossible, the busy mother interrupts her work many times watching at the window.

The accompanying arrangement and circuit show a simple and effective method of relieving anyone from such a task. It acts as a ticket holder and announcer when necessary and might be of interest to prevocational teachers.

The small holder shown at A may be fastened to the rear porch of the house. The small piece of copper B, is bent slightly so as to make a contact with the small spring C, and the knife switch D thrown in completes the circuit.

When the announcer is not needed, the knife switch is thrown out and the milk ticket placed between the copper plate B and brass spring C each morning. The "milk-man" removes the ticket from its holder each day and usually appreciates the fact that the ticket is in the same place.

When the last ticket is reached and more are to be purchased, the knife switch is thrown in completing the circuit. The ticket is placed as usual between Band C, breaking the circuit. When the "milk-man" removes the ticket, the circuit is again completed and his arrival is announced by the bell or buzzer E.

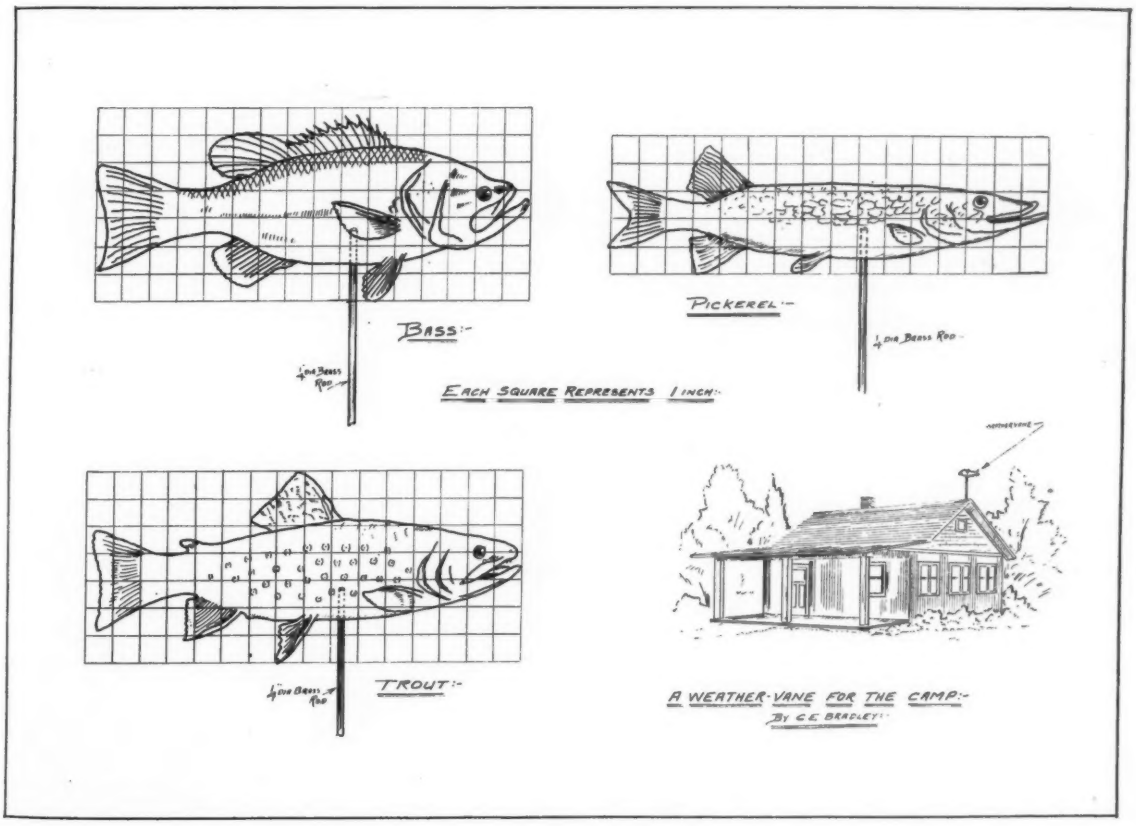
The knife switch thrown off again breaks the circuit.

A WEATHER-VANE FOR THE CAMP

C. E. Bradley

A neat weather vane that will truly indicate the direction of the wind makes an interesting project for any vocational class. This kind of work especially finds favor as a sort of extra or fill in project with more ambitious students who finish their regular class work in advance of other members of the class.

Lovers of the out-of-doors, and camp owners, are always willing recipients of these vanes when completed. Ready sales of the finished articles can also be made if desired.



LOUIS XVI DRESSING TABLE, BENCH AND FLOOR LAMP.

For the fisherman or camp owner the suggestions offered in the accompanying sketches will prove interesting.

Templates in stiff cardboard should be first plotted out carefully in accordance with the drawings. These can be cut out with sharp shears and the design traced on white pine or cedar stock about 5/8" thick. After sawing out and smoothing up, oil painting in different combinations of colors offers further pleasing and fascinating work.

Short brass rods, about 3/16" diameter, should be used for the vanes to pivot on.

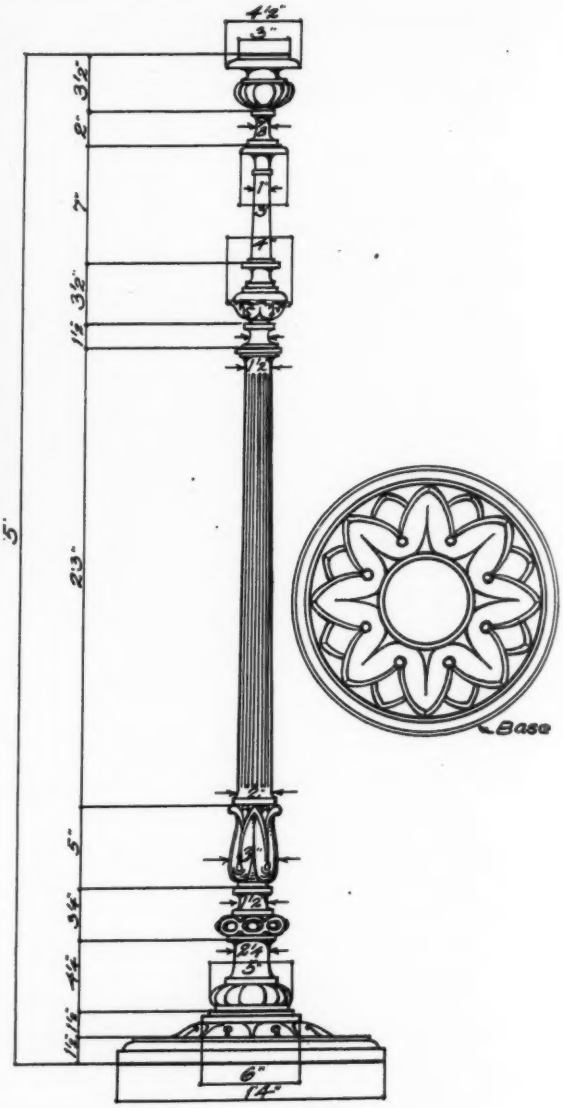
This type of fill in or extra class work always tends to create sincere interest and genuine enthusiasm.

FURNITURE FOR A DRESSING ROOM

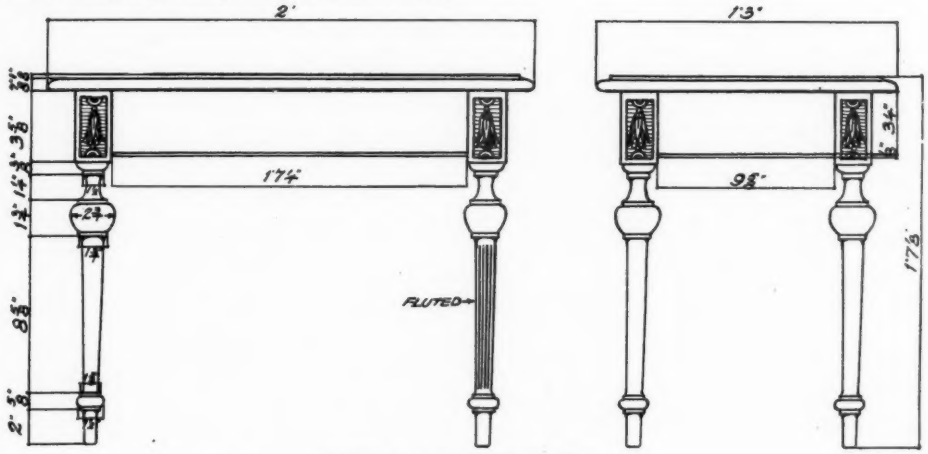
Reinhold Forkel, Instructor in Crafts and Woodworking, The School of Industrial Arts, Trenton, N. J.

The accompanying photograph of a Louis XVI dressing table, bench, and floor lamp are the work of a student in the woodworking department of the school of Industrial Arts, Trenton, New Jersey. The student is a graduate from the three-year day technical course and devoted his full time during a fourth year to woodworking, specializing in this department for entrance into the teaching profession.

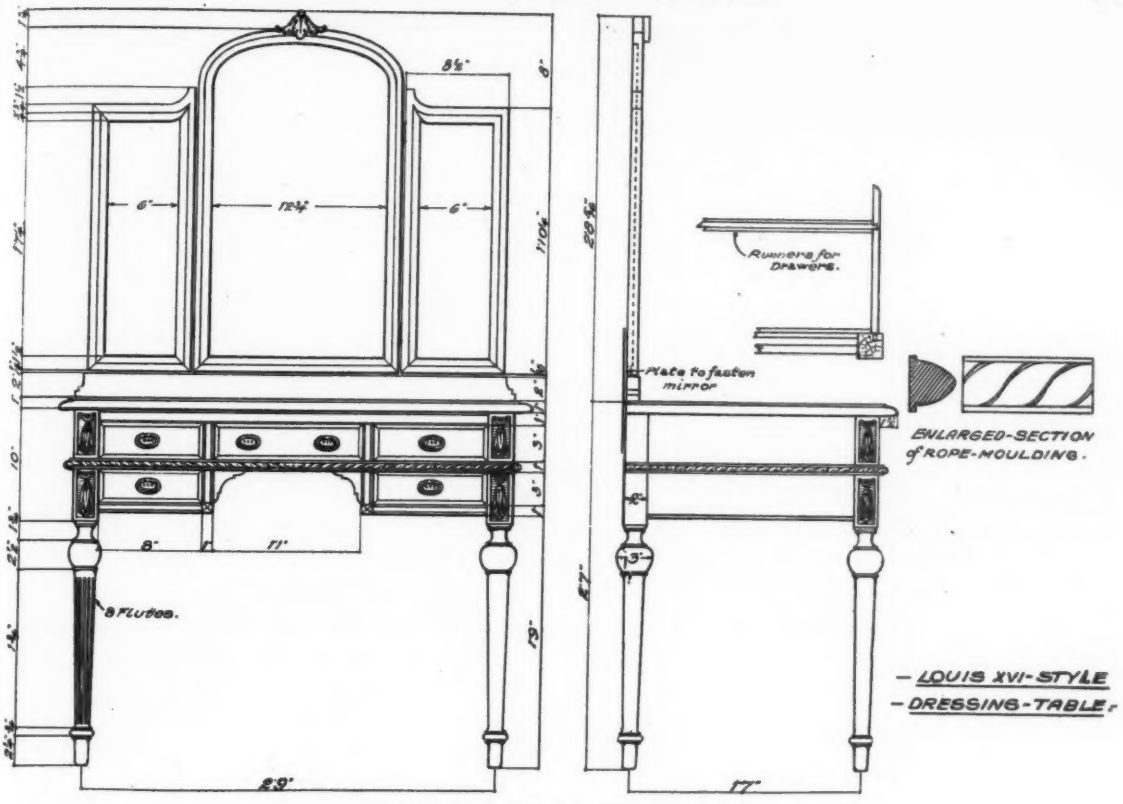
The woodworking department of the School of Industrial Arts offers a thorough study of all branches in the



DETAILS OF A FLOOR LAMP.



DETAILS OF A DRESSING SEAT.



DETAILS OF A LOUIS XVI DRESSING TABLE.

woodworking crafts, as cabinet and patternmaking, modeling and wood carving, period furniture, inlaying, and wood-finishing. Great weight is laid on drawing and sketching, which creates great enthusiasm among students to design and execute something original.

The three pieces of furniture are close adaptations of the Louis XVI period. Each piece is well proportioned and well balanced, and the lines are very pleasing. The fluted legs and the moulding applied around the frames of the mirrors, the top, and around the drawers, relieves the plainness. The carving is simple but well placed and adds greatly to the beauty of the pieces. Period hardware is likewise well matched and attractive.

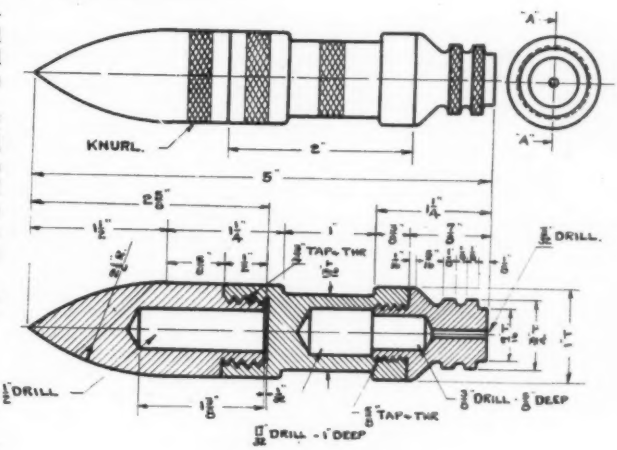
All pieces are constructed of solid mahogany, stained a rich brown, varnished and rubbed to a high gloss.

A PLUMB BOB

Elmore G. Hansen, Chicago

This drawing shows a plumb bob which makes a good machine shop problem for the high school student.

This project gives practice in turning, drilling, threading, tapping, and knurling.



SEC. "A-A"

DETAILS OF A PLUMB BOB.

CLEANING PAINT CONTAINERS

S. E. Strand, Muskegon Heights, Mich.

Manual training instructors almost invariably have trouble in keeping paint and varnish containers clean. Painting and finishing operations in the school shop are always carried on at odd intervals and the ordinary methods of cleaning containers cannot be used.

A good plan is to use gray granite ware as paint and varnish containers. This ware can be cleaned by taking it to the furnace and letting the fire do the work. Simply place the pail or the container in the fire and allow the accumulation of paint or varnish to burn off. When the granite ware is removed from the fire, it must be cooled gradually and must not be washed until after it is cold.

I have found this method to save time, temper and drudgery in the finishing room and to effect a considerable economy in upkeep.

A SPEED TEST IN MECHANICAL DRAWING

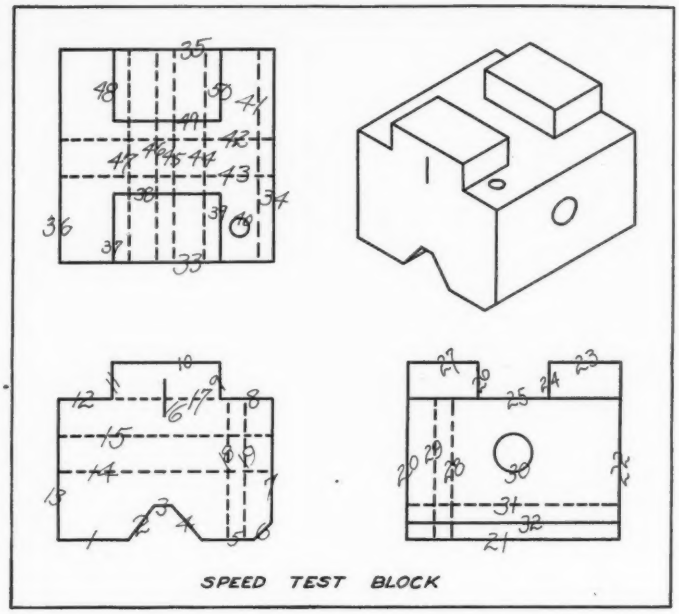
Paul E. Klein, Memorial Junior High School, San Diego, California

In mechanical drawing, as in any other school subject, where quality is paramount, it is well occasionally to introduce some feature not in line with the general routine of the daily classwork.

The speed test illustrated in the accompanying drawings has been used by the writer for this purpose. It was given the last day of the 9B semester. While largely of a stunt nature, it is certain there are advantages in having the boys occasionally draw at high speed. In later life the boys must face the problem of speed as well as quality in work.

The boys were allowed a few minutes in which to prepare their tools and instruments for the test. When all were ready, the isometric or perspective of the block was unveiled, and the students given twenty minutes in which to reproduce it in orthographic projection containing fifty lines.

Calling the project a fifty-line dash, with starter, timers, and judge, the boys entered into the project with the zest displayed in an athletic event. Winners of the first, second, and third places were mentioned in the school paper as the school's fastest and best draftsmen.



SPEED TEST BLOCK

BIRDHOUSE CONTEST AND DISPLAY AT PENN HIGH SCHOOL, GREENVILLE, PA.

L. W. Kunkle, Instructor

The students of the industrial arts department in the Penn High School, Greenville, Pa., have completed their second annual birdhouse building contest. The students are of the eighth grade or first-year class, and the ninth, tenth or second-year class. Members of the first-year class were required to enter the contest, while it was optional with the second-year class.

One of the outstanding features of this year's work was the variety of designs. Rustic or bark covered houses predominated.

Prizes were awarded to the students winning the first, second, and third honors. There were prizes for both classes; the prizes being the same for both. The local Kiwanis and Rotary clubs offered the prizes which were: first, a cabinet and wood working tools; second, a box camera; third, a bird guide book.

The accompanying illustration shows the display and the winners of the prizes. From right to left are the first, second, and third winners in the first-year class and then the first, second, and third winners in the second-year class.

It is of interest to know that the winner of the first prize in the second-year class was a student who has the use of his left arm and hand only; the other being paralyzed. His work and house commanded unusual attention and comment by those who viewed the display.

BOOKBINDING COURSE AS CARRIED ON IN THE CASS TECHNICAL HIGH SCHOOL, DETROIT, MICH.

C. Neville Walker, Detroit, Mich.

Bookbinding has become a highly specialized trade. Certain divisions of the business are well suited to the tastes and energies of young women. Skill and effort find opportunities for advancement in both position and remuneration. There is a constant demand for workers with a fundamental fund of information and positions are secure practically the year round.

The course offered in the Cass Technical High School simply offers a girl the fundamentals, but at the same time it enables her to go into the industry with a working knowledge which is in general demand. Each bindery has its own working methods, and its method of binding books and it is necessary that each worker become acquainted with the special methods of the shop where she is employed.

At present the bookbinding course covers a period of two years. It begins with ordinary pamphlet forms, and proceeds to folding for different number of pages; knowledge of varieties of paper stock and uses; folding by hand and by machine.

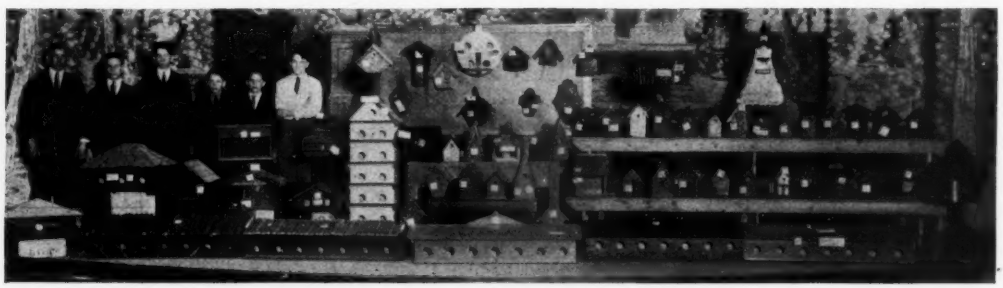
Case-making follows next. As each book is sewn, the case is made, the book inserted, end sheets attached, and pressing and labeling done.

Flexible binding is also taken up, that is, sewing on tapes or rope without cutting into the back.

In connection with the course, each student is taught the use of the various machines incidental to bindery work, such as the stapling machine, stitcher, punching machine, perforator, cutting machine, and round cornering machine.

Repair work is taken up in detail; torn leaves, ragged edges, split backs, loose covers and a variety of happenings that occur to much-handled books are used as lessons for increasing the skill of the student.

It is planned that with the enlargement of the scope of work offered further advanced courses may be added for the benefit of students who express their preference for bindery work.



BIRD HOUSE DISPLAY—1924—AT THE PENN HIGH SCHOOL, GREENVILLE, PA.

AN AID TO TEACHING ARCHITECTURAL DRAWING

J. Alfred Nelson, Sault Ste. Marie, Mich.

The accompanying engravings illustrate cardboard model houses made in the architectural drawing class by students of the Sault Ste. Marie high school.

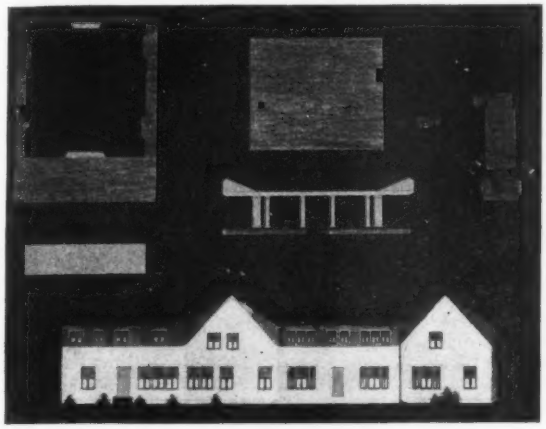


FIGURE 1.

The models are made to scale, ¼″=1′-0″ and are constructed of six-ply bristol board. Crayons were used to color the houses and India ink outlined the windows, doors, and other details.

In our course we work up preliminary drawings on tracing paper. One floor plan may be worked up directly over the other. The same is done with the elevations, thus saving much time. By penciling the back of elevations, which are drawn on tracing paper, we can "rub" them directly on the bristol board, and then ink the outlines and details. The bristol board will not stand much usage, and it is best to keep the surface in good condition for inking and coloring. A cold glue is used for gluing up the models, which are mounted on pieces of wall board cut to fit the floor plan.

The problem has been very interesting to the boys and, I think, has been very much worth while. In order to construct a model, a boy must have a good idea of the finished product. He must read the drawings accurately and visualize the result.

Every house presents different problems in the development of surfaces and is a definite test of the maker's ability to read working drawings. Incidentally, many principles of design and planning are illustrated and taught.

How many contractors would not do a larger business if they could show clients what their houses would look like when completed even before work is begun? Fewer people would be disappointed with the final results.

FIGURE 2.

FIGURE 3.

McKINLEY SCHOOL DEDICATED

McKinley Vocational School, Buffalo, New York, was formally dedicated on March 19th. This is the first time in the history of Buffalo that a vocational school has been dedicated with ceremony. Heretofore the four vocational schools have been makeshifts. McKinley Vocational School is the first to be provided with permanent quarters.

This school is the outgrowth of the Black Rock Vocational School which began as a department in School No. 20 fourteen years ago. The first course offered was patternmaking; and to this other courses have gradually been added until today instruction in seven trades is given at the McKinley School.

NEWS AND NOTES FROM THE FIELD

New Vocational School. With the completion of the Vocational School at Atlantic City, N. J., new courses will be added and additional members placed on the faculty. In addition to various classrooms and shops, the building will provide for an auditorium and gymnasium. Next year the closing exercises will be held in the newly occupied building.

The Indianapolis Chamber of Commerce in conjunction with the Indiana University, has issued a monograph entitled "Banking as a Profession." It goes into the practical duties of the several positions filled by the bank personnel. The function of the bank as well as its general operations are described.

PERSONAL NEWS

Director Moves Office. Mr. George Loewy, Director of the Division of Vocational Activities, New York City, has moved his office from the Murray Hill School to the eighth floor of the headquarters building at Park Avenue and 59th Street, Manhattan.

Mr. G. J. Ehart of Stevens Point, Wis., has resigned to accept a position at Janesville. Mr. Ehart succeeds J. M. Dorrans.

Mr. Emmert Brooks has been elected as director of manual training and mechanical drawing in the high school at Audubon, Ia. He succeeds C. R. McIntire.

Mr. R. L. Cooley, director of the Milwaukee Vocational School, in June was given the honorary degree of master of arts by the University of Wisconsin. Mr. Cooley took charge of the old vocational school when the work was in its infancy and through his efforts the school is now recognized as one of the leading institutions of its kind in the country.

Mr. E. B. Hammond has been reelected chairman of the board of trustees of the Vocational School at New Bedford, Mass.

Miss Grace Lee Knell, supervisor of art in the schools of Ridgewood, N. J., died in June. Resolutions were adopted by the board commending her long and faithful service to the schools and expressing regret at her untimely passing.

C. A. Jay was elected president of the Dallas, Texas, Vocational school. Half a million dollars has been subscribed by prominent business men of Dallas to establish the school, it is said. "The lack of an adequate supply of skilled labor is doing more to retard the industrial development of the southwest than any other single factor," declared Mr. Jay. "The purpose of this school is to alleviate this condition."

Mr. Wm. M. Castle, employer member of the board of vocational education at Oshkosh, Wis., has resigned because of ill health. Mr. H. E. Rosenkranz has been appointed to succeed Mr. Castle.

Mr. C. S. Stahlberg, manual training teacher at Eatonville, Wash., has been given an increase of $250 in salary.

NEW BOOKS

Engineering Drawing

By Thomas E. French. Third edition. Octavo, cloth, 409 pages. Price, $3. McGraw-Hill Book Co., New York, N. Y.

This is the third edition of a book which has been deservedly the most widely used college text in advanced mechanical drawing. The text is unchanged in essential material, in method and plan. A few chapters have been shifted, and many minor changes have been made in the direction of harmonizing problems and methods with the newest commercial practice. The dimensioning of drawings has been developed into a separate chapter, and entirely new chapters on perspective drawing and on charts and graphs have been prepared. A glossary of shop terms has been added to the appendix.

It is pleasant to find that an old friend like "French's Engineering Drawing" is keeping pace with engineering teaching and practice and is as fresh, useful and helpful as it was thirteen years ago.

Arithmetic Assignments

Prepared by the teachers in the Manhattan Trade School for Girls, New York City. Paper, 102 pages. Price, $0.90. A. S. Barnes & Co., New York, N. Y.

The Dalton Plan of Education as developed by Miss Helen Parkhurst has proven an inspiration to the Manhattan Trade School faculty. The institution is an industrial trade school for girls whose interests do not lie along academic lines but rather in an industry of one sort or another.

In planning the work it was found that pupils took a keener interest in academic subjects if they were closely correlated with the trades for which they were being prepared and if they were taught from the standpoint of helping them to secure better positions and better opportunities for advancement.

With the regular classwork such a correlation proved almost impossible, and it was not until the evolution of the Dalton plan that the school was able to meet the needs of individual pupils. The plan provides the most desirable method of teaching both the trade and related subjects to the pupil, and it permits pupils to advance at varying rates of speed.

The present booklet provides a series of assignment sheets in arithmetic, offering a correlation between vocational and general subjects. The work presupposes a working knowledge of all necessary arithmetical processes before entrance into the school and makes possible an application of this knowledge to the trade, to wage earning and wage spending. It also makes possible greater accuracy and efficiency in trade work and leads to more intelligent and economical use of earnings.

The booklet contains 146 exercises dealing with practical problems and a series of instructions for performing the work and for keeping records of work accomplished. Assignments are outlined for dressmaking, millinery, novelty work, and for operating dressmaking or novelty shops. Among the subjects covered in the problems are time estimating, fractions, accounts, fundamental operations, estimating wage earning, work in dozens and gross, cost of materials, tucking and hemming, making out novelty, millinery and other operating bills, discounts, percentage, pleating and drafting. There is also a group of review problems and a few miscellaneous problems dealing with cost estimating for various novelty lines.

The booklet has been carefully arranged and is entirely practical in its scope and general usefulness. It should prove helpful in girls' classes in vocational and trade schools where there is abundant opportunity for correlative work and for fitting the course to the needs of girl students.

Automotive Manual

By Albert Leroy Taylor and A. Harold Blake. Cloth, 178 pages, illustrated. The Macmillan Co., New York, N. Y.

This book provides a brief course in automobile mechanisms and suggests a series of practical maintenance and repair jobs. The work is ample for the high school which has limited equipment and time, and where the course is cultural and general in purpose, rather than strictly vocational.

Book Composition

A series of 27 booklets. Issued by the Department of Education, United Typothetae of America, Chicago, Ill.

This group of lessons for apprentices follows the earlier series on the elements of composition and takes up in detail the special forms of work demanded in the composition and make-up of books. Unit one consists of seven lessons in plain book composition; unit two provides eleven lessons in special book features or conventions of arrangements; unit three is made up of five lessons in tabular work; and unit four includes three lessons on legal briefs, periodicals and house organs. The course requires about 205 clock hours to complete, but no student of average intelligence who completes it can fail to grasp all the essential details of book work.

Print Shop Arithmetic

J. A. Ginsbach. Cloth, 8 vo., 52 pages. Price $1.00. Manual Arts Press, Peoria, Ill.

The mathematics of the print shop is simple, but important, and frequently puzzling. The present book confines itself to the calculation of type; space measurements; cutting, cost, and comparative weights of paper stock; and the size of ruled forms. It provides all that the average boy, who is studying printing as an industrial arts or vocational subject, will have a direct use for. As related work for the school shop the material is nearly ideal.

Farm Accounting

E. L. Carrier, N. J. Lennes, A. S. Merrill. Cloth, 287 pages. The Macmillan Company, New York.

This book offers a complete introductory course for high schools and vocational agricultural schools. It applies true accounting methods to general farm accounts, farm cost records, special farm record keeping. There is a wealth of laboratory work for practical accounting.

PUBLICATIONS RECEIVED

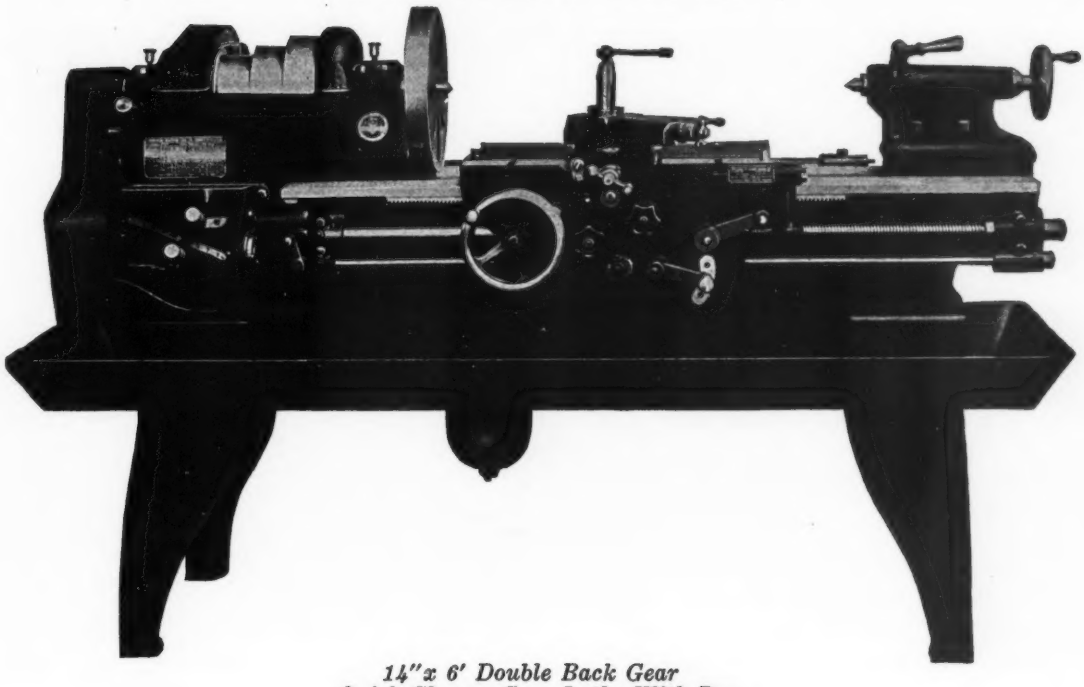
Everyday Art. A monthly publication issued by the American Crayon Co., Sandusky, Ohio. The booklet outlines some fine work in designs for tile and contains an article on poster making for schools.

One Hundred Years of Occupational Therapy. A local history by Mr. Louis J. Haas, director of therapeutic occupations at the Bloomingdale Hospital, White Plains, N. Y. The pamphlet traces the history of the first movement to introduce manual employment among the patients of institutions for the care of mental cases, and describes some of the work carried on in the White Plains institution under the direction of Mr. Haas.

Refinishing Pine Chest

Q. 473. I have a chest of drawers made of pine, which was formerly painted. We have removed the paint and scraped the wood. Can you tell me how to refinish it so that it will have the natural finish of mellowed, old pine?—K. T. F.

A. If possible all surfaces to be finished should be planed to new bright wood in order to effectively remove all traces of the old finish. It is rarely possible to scrape pine with any degree of success. In any case sand the finish to new bright wood, finishing up with worn out 00 sandpaper and felt pad. The coloring typical of old pine may best be secured by using a high grade orange shellac reduced with at least four volumes of denatured alcohol. This should be applied with a wide soft Fitch varnish brush using as long strokes as possible in order to avoid any lap in brush strokes which will show as blotches of color beneath the varnish finish. Shellac should be allowed at least three hours drying in a warm room and may be then sanded with a split 6-0 paper in such a manner as to entirely smooth the surface of the wood but avoiding any tendency to sanding light spots in the color. Dust off and give one, two or three coats of high grade Floor Varnish, allowing from three to five days between coats, sanding the first two and rubbing the last with felt pad, FF pumice stone and water. Clean with a good polish.—Ralph G. Waring.



14"x 6' Double Back Gear
Quick Change Gear Lathe With Pan

More Monarch Lathes are being used in manufacturing plants throughout the country than any other make. More Monarch Lathes are being installed in Manual Training Departments of schools than any other make of lathe. The student, upon completion of his school work, will find himself coming in contact with Monarch Lathes in most shops.

Monarch Lathes are built in sizes ranging from 9 inch to 30 inch swing, and bed lengths from 2½′ to 30′.

Our Engineering Department will gladly submit plans and layouts for machine shop installations and we are in position to give Vocational Instructors valuable information and plans, for which no charge is made.

There is a Monarch Dealer near you, who will gladly show you the merits of Monarch Lathes.

Let us send you Special Vocational Bulletin.

THE MONARCH MACHINE TOOL CO.

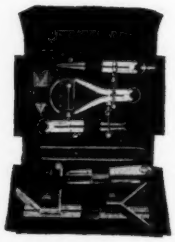
304 OAK STREET **SIDNEY, OHIO**

Largest builders of high grade engine lathes and specialist in lathes for Vocational Training.

"All Starrett's!"

"Boy—you certainly come well recommended."

"Yes—that's what the foreman said when he looked over my kit this morning. And right away he wanted to know how soon I could come to work."



STARRETT SETS

Do you own a Starrett Catalog? It will help you select the tools you need most—shows uses, prices, etc., of over 2100 fine precision tools.

Free. Write for No. 23 "CE."

THE L. S. STARRETT CO.

The World's Greatest Toolmakers.
Manufacturers of Hacksaws Unexcelled.
ATHOL, MASS.

Starrett Tools

6226

NEWS AND NOTES

Hold Art Exhibit. Many varieties of work were included in the grammar school art exhibit which was held June 2nd on the sixth floor of a local furniture store at Tacoma, Wash. The exhibit was arranged by Miss Jessie Lathrop, head of the grade school art department and was sponsored by the firm in whose building the exhibit was held. Among the displays were room interiors, dress designs, drawings, and other products of the art classes. Six loving cups were awarded for the best room interiors.

Adopt Program for Industrial Training. A program calling for the establishment of evening trade schools and the establishment of classes in trade subjects in cities and towns of eleven western states has been worked out by the respective state superintendents of industrial education. In states where coal mining is the principal industry, trade schools and trade classes in existing schools will be established where miners may receive instruction in mining methods. In metal mining states such as Nevada, Montana, Colorado, Arizona, New Mexico and California, similar schools and classes will be established for men engaged in the trade. In lumbering communities similar schools and classes will be established, and in large cities mechanical and industrial trade schools will provide courses for men and women engaged in manufacturing trades.

Summer Courses Offered. Clemson College at Clemson College, S. C., has established summer courses in textile work and manual training for the benefit of teachers.

Vocational Department. Plans have been made for establishment of a vocational department in the Markle High School at Huntington, Ind., with the fall opening of schools.

District Supervision Installed. At Middletown, O., the district system of supervision for manual training and domestic science has superseded the former plan of supervision. Mr. C. J. Hughes will have charge of two schools and Mr. J. S. Singleton will conduct the work in the remaining two schools. Under the new plan the board expects to effect a saving and to overcome the deficit of $10,000 which it faces.

New Vocational School. The old Rose Polytechnic School at Terre Haute, Ind., is being remodeled to house the Gerstmeyer Vocational School. The cost for remodeling and equipment will reach $65,000.

Boys Turn Out Furniture. Floor lamps, beds, chairs and radio cabinets were the principal articles turned out last year by the manual training class at the high school, Galesburg, Ill. Other pieces completed by the boys were dining-room chairs, a davenport table, a dressing table, and a tea wagon.

Manual Training Display. The manual training department of the high school, St. Claire, Mich., held its annual exhibit on June 14th and 15th. Different phases of manual training were exhibited such as caning, art-fibre weaving and upholstering work with different kinds of finishes. Cedar chests, tea wagons, chairs, tables, pedestals and table lamps were among the pieces of furniture displayed.

Annual June Exhibition. The girls of the Wheelock Junior High School of New York City held their annual June exhibition of drawing and sewing on June 20th. Teachers in the school, parents of the girls and visitors, purchased many of the articles made during the past term. Among the articles on display were tablecloths, towels, dresses and designs.

Pre-vocational School Exhibit. Exhibits of the pre-vocational work of pupils in the seventh and eighth-year classes of School No. 119, Manhattan, New York City, were held on June 19th. Hand made novelties of numerous descriptions were on sale at cost prices. Among the articles were silk bureau boxes and trays, cretonne sewing boxes, pocketbooks, bags, teapot stands and table runners. Hand made millinery, made by girls in the seventh and eighth-year classes were sold at low prices.

Shop Classes Turn Out Large Amount of Work. At Burlington, Iowa, the shop classes in the high school have turned out a large amount of work for other departments. During the past three years a total of 434 jobs have been completed for other school departments. The material for these jobs cost $1,428 and required 4,542 hours of work on the part of the boys in the department. The cost of these jobs if they had been done in a commercial department, would have reached the sum of $4,056.

(Continued on Page 20a)

PRINTING

The Modern Educational Tool

PRINTING IS AN INDUSTRIAL ART THAT COMBINES CULTURAL AND MANUAL EDUCATIONAL ADVANTAGES

Language–The raw material of Printing is language–any language. Through the art of Printing the pupil is brought into close contact with the best literature and a desire is aroused for greater knowledge of the mechanics of language.

Spelling–Greater appreciation of accuracy is aroused by means of printing. The sight-sense pupils are most readily taught spelling through type composition.

Grammar–Abstract methods of teaching this important subject are uninteresting. Motivate grammar by means of Printing.

Art–The principles of design are always taught in connection with Printing–"The Art Preservative of all Arts."

Punctuation–"Cold Type" demands a proper use of punctuation marks. Commas, periods, colons, semicolons, quotations, exclamation and question marks mean something to the pupil who is taking printing instruction.

Mathematics–The mathematical problems in Printing are interesting and can be used in any grade from the sixth to the high school.

Drawing–Freehand and Geometrical drawings are used freely in Printing.

Science–The theory of light, heat and electricity should always be correlated with Printing. The laboratory problems should be the making of paper, ink and printers' rollers.

Superintendents of schools and principals are urged to request further information about Printing–the Modern Educational Tool. Write to

F. K. PHILLIPS, *Manager of Education Department*

American Type Founders Company

300 Communipaw Avenue, Jersey City, N. J.

Selling Houses in most of the Principal Cities. Let Us Tell You of the Nearest One

At home and abroad the work it enables users to do makes

DIXON'S
ELDORADO
"the master drawing pencil"

IF you have never purchased this pencil for your classes, sit down now and write to us, telling us the degrees of hardness you are interested in. We will gladly send you free samples of them, full size.

Joseph Dixon Crucible Company
Pencil Department 128-J
JERSEY CITY NEW JERSEY

(Continued from Page 18a)

The jobs cover a wide range of work. They include several sets of dining room furniture for the domestic science department; stage settings for the high school auditorium; study tables for the high and grade schools; built-in combination book cases and clothes closets for the high school; trophy cases and bulletin boards for the various schools; bookkeeping desks for the part-time school; repairs on playground apparatus and on department equipment; maps, drawings and blue prints for the administrative officers. A cedar chest and two candlesticks made by one of the boys in the manual training department were constructed at a cost of $12 (not allowing for time), while the commercial cost would be about $40. A phonograph cabinet, also one of the shop products, was built at a cost of $7, while the store price would have reached $20. A seven-piece dining set, built by several members of the department, was completed at a cost of between $20 and $25. A similar set would have been priced at $75 or $80 in a furniture store. These pieces are frequently made by the boys for use in their own homes and the builder thus takes an added personal interest in the construction, design and finish of the product.

Establish School Art Guild. The Detroit Society of Arts and Crafts held an exhibit, open to students of the arts and crafts, in the Arts and Crafts Building, May 10th to 17th. Handiwork of pupils in all grades from the kindergarten through college was exhibited. In connection with the exhibit, illuminated parchments were given to the 25 elementary pupils submitting the best art work.

Courses for Part-Time Classes. The department of Smith-Hughes Vocational Education of Kansas State Teachers' College, Pittsburg, has announced courses in "The Principles and Instruction of Part-Time Schools and Classes" and "Organization and Instruction of Part-Time Classes."

Auto-Mechanics Department Occupies Building. With the opening of school in September, the original buildings of the Baltimore, Md., vocational school will be devoted to auto mechanics and its allied branches, and related academic subjects. The shops are modern and accommodate an increased enrollment. The pattern making shops will continue in their present location, while painting and decorating will be taken care of in the annex.

The old School No. 93 has been remodeled and will be devoted to vocational classes. The second floor will house the electrical department, as well as classes in related work. The first floor will be used for the machine shop, cabinet and carpentry shop, one classroom, and the office. Modern tool rooms will be installed in each shop and a finishing room will be provided for wood working.

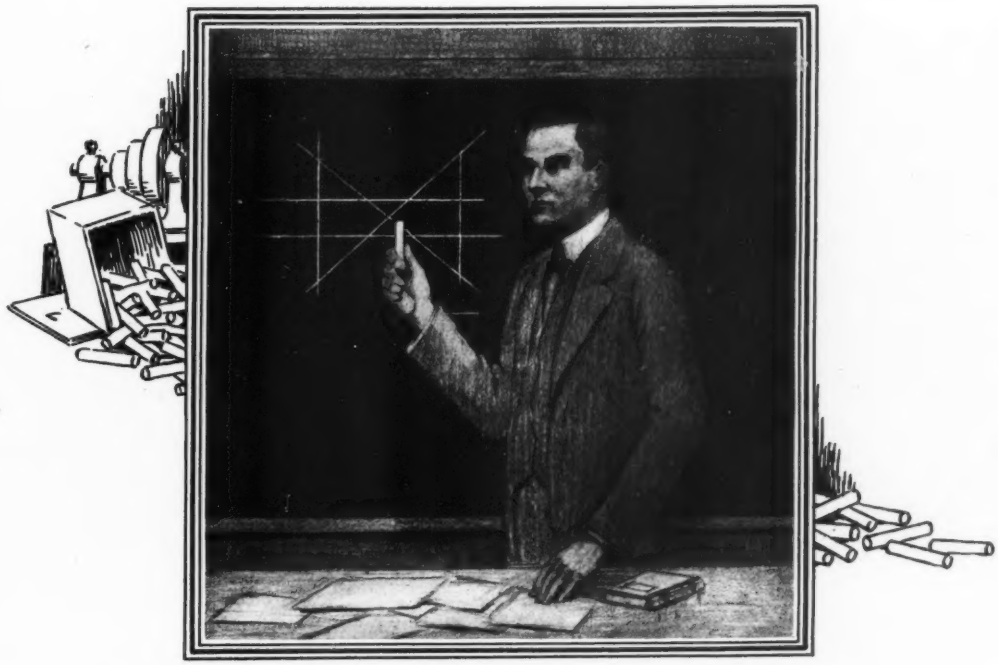
Issue Instructional Material. The Kansas State Teachers' College at Pittsburg, Kans., plans to issue the coming year a variety of instructional material in printed form for the benefit of teachers in vocational trade and industrial subjects. The school has recently announced the publication of a series of short unit courses for directors and teachers of evening classes, and for trainers of evening school teachers. The courses present the advantages and objections to short unit courses as compared with long-period courses. Suggestive outlines and lesson plans in a number of trades have been compiled, which are to be available as "helps" to teachers and directors.

Choosing Life Careers. One of the criticsms made of college graduates in the past has been that they come from the commencement exercises with an education, but educated with no purpose in view and fitted for nothing in particular. The average student should decide, either before entrance or during his course, what his life work is to be.

West Virginia University has employed Mr. H. E. Stone as director of vocational guidance and placement work in the University. He has devoted a large part of his life to this work and has conducted extensive researches into almost every field of industry. Previous to his acceptance of the present position, he held over 7,000 conferences with persons in the predicament of many seniors and undergraduates at the present time.

Extend Vocational Courses. Plans have been adopted for enlarging the scope and work of the vocational trades classes in the Fremont high school at Fremont, O. Students in the second and third-year classes will spend one-half day in the shop and one-half day in academic work. In the senior year, students will be allowed to work a week in a local factory and attend school alternate weeks.

(Continued on Page 22a)



For Teachers of Industrial Art, the Best of Blackboard Chalks

Are those made from non-plastic, non-adhesive, pure, washed and precipitated natural chalk. Such crayons make clear white lines which can be quickly and easily erased.

Just such chalks are our Waltham and Hygieia brands. We recommend them unhesitatingly to all Industrial Arts readers, as two grades which will render complete satisfaction.

We would be only too glad to have you test for yourselves the truth of our statements.

The AMERICAN CRAYON COMPANY

ESTABLISHED 1835

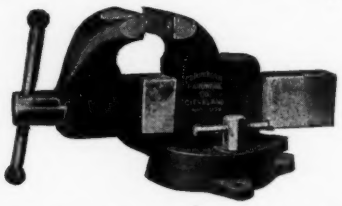
SANDUSKY · OHIO **· NEW YORK ·**

"Old Faithful"

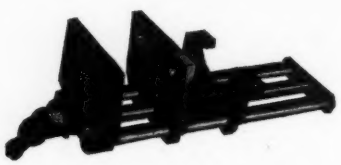
COLUMBIAN

Vise Equipment meets every need

You can get Columbian Vises for every department of your school.



Columbian Malleable Iron Machinists' Vises will give real service. Made in all standard types and sizes.



Columbian Manual Training Vises are widely used in all wood working industries. Choose the style and size to meet your needs.

Columbian Forged Steel Leg Vises have been a standard in iron-working, structural steel and blacksmith shops for years. They are built to withstand the most severe usage.

Instructors:

A copy of our complete catalog will help you in planning your future equipment. Send for one.

The Columbian Hardware Co.

World's largest makers of vises and anvils

Cleveland

(Continued from Page 20a)

Discontinue Manual Training. In line with a policy of retrenchment, the school board at Crestline, O., has discontinued manual training classes for the year 1924-1925. It is expected that the department will be reopened as soon as the financial situation improves. During the past year the department has been in charge of Mr. N. P. Richmond.

Newark Teachers Issue Publication. Under the title of "Making Men" the Newark, New Jersey, Association of Manual Training Teachers has issued a small paper devoted to the interests of the manual training department. The paper is intended as an inspiration to those concerned with school shop activities as a means of motivating education for boys. Mr. Edward Van Houten is president, and Mr. Stephen Beers, secretary, of the association.

Summer Course in Pottery. Lewis Institute, Chicago, will offer this summer two courses in practical pottery, one to be given from June 23 to July 18, and the second from July 21 to August 15. The classes are to be held five mornings each week and the work has been outlined to give the student sufficient knowledge to enable him to give practical instruction in pottery making. A registration fee of $5 and a tuition fee of $10 are required.

Four-Year Printing Course. Cass Technical High School at Detroit, Mich., has announced the general program for a four-year technical printing course. The course embraces work in the printery, science subjects, English subjects, physical training, commercial subjects, design and lettering and suitable credits are assigned to each subject as completed by the student.

Book Binding Course. A course in book binding is offered at Cass Technical High School, Detroit, Mich., for girls desiring a knowledge of the fundamentals with the idea of entering the industry. The course covers two years and embraces such work as handling of pamphlet forms, folding pages, knowledge of paper stock, folding by machine, case-making and flexible binding. Repair work which is dealt with in detail, covers the restoring of torn pages, split backs, and loose covers. Actual work in a variety of repairs is offered as lessons to increase the skill of the student.

Vocational School Sold to County. The Newark, N. J., school board has sold the boys' vocational and building trades school to the county for $1,300,000. The transfer means that the smaller towns and villages in Essex County will share with Newark in the benefits of the school.

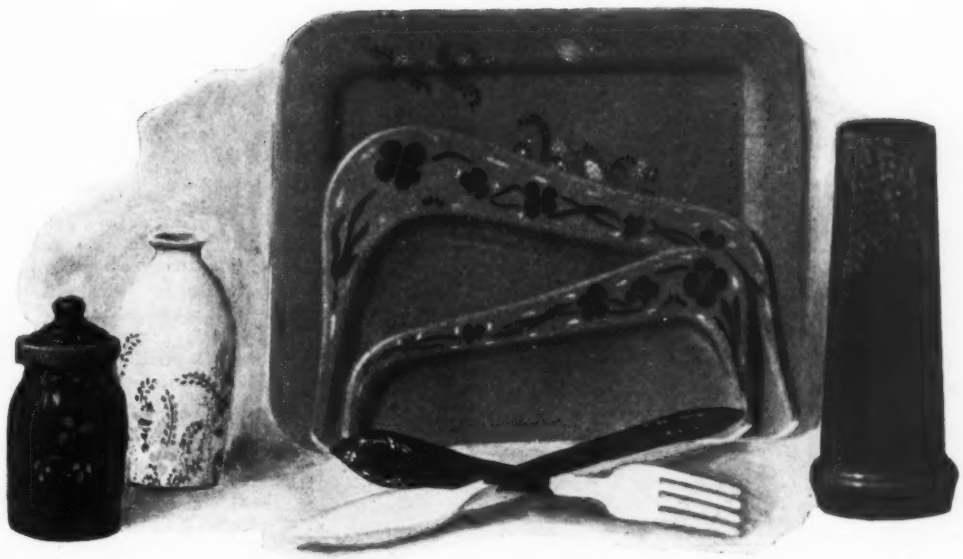
Cost of Instruction for Part-Time Pupils. From a study of sixteen cities in Michigan, not including Detroit, the average per capita cost of instruction for part-time pupils is $42. The fact was ascertained by K. G. Smith, state supervisor of vocational education, who also states that such instruction for one year of 288 hours represents a student cost of slightly less than fifteen cents per student hour. Mr. Smith adds: "The way to reduce costs in a part-time school is not to increase the size of classes, but to place pupils whenever possible on some sort of a training program in industry or commercial work, so that this may be considered equivalent to four hours of instruction. This is in line with the present tendency to develop a modern system of apprenticeship.

Questions School Budget. The city commission at Grand Rapids, Michigan, has questioned the school board's budget. "I think perhaps the trouble is that the general public does not know just where all the money goes and does not understand what the schools are doing," said Mr. H. N. Morrill, secretary of the school board. "When a city commissioner calls manual training 'vocational work' and refers to art as 'drawing pictures' it looks as though the commisisoners might do well to visit the schools more often and find out what is really being done."

No Reduction in Service Hours. The board of superintendents of the New York City schools has voted against any reduction in hours of service in the vocational schools of the metropolis.

According to Supt. Edward Stitt, it is the purpose of these schools to train pupils for such pursuits as will demand mechanical skill. "After leaving such schools," he adds, "pupils will be expected to work for eight hours a day and probably for fifty weeks during the year. It is wise that as part of their apprenticeship they should become accustomed to a longer day than ordinary school children. Longer sessions are necessary to bridge the gap between school time and shop time.

It Encourages Students to Better Work



THE natural interest of the student in his own handiwork is heightened and strengthened if he is permitted to finish his work with Enamelit.

For the color beauty of Enamelit gives the work a genuinely professional charm. The sparkle and brilliancy of the color cover over whatever rough spots there may be. The cheerfulness and attractiveness achieved make both teacher and student proud of the work.

Art teachers like DEVOE Enamelit not only for its color beauty, however, but equally because it is so easy to apply and so quick to dry. There is a variety of 22 colors to choose from, any one of which is a challenge to the student to do better work.

New York **DEVOE & RAYNOLDS CO., Inc.** **Chicago**

DEVOE ENAMELIT

Makes Craftwork More Beautiful

GENUINE
TRADE MARK
"Jorgensen"
REG U S PAT OFF
STEEL NUTS
STEEL SPINDLES

Look for the name.
The first successful steel spindle handscrew.

HARD MAPLE JAWS

10 sizes Adjustable
10 sizes Non-Adjustable

Write for catalog and prices or get them from your dealer.

ADJUSTABLE CLAMP CO.
216 N. Jefferson St., Chicago

In *record* time!

An intricate drawing inked complete in record time. No blots, no stops because the ink gummed, became too thick or too thin, but—the finest lines made rapidly, the ink flowing smoothly, freely and the finished work drying quickly.

DIETZGEN DRAWING INKS were used, of course.

Sold in various size bottles.

Black and ten colors. Colors dense, true, brilliant. Black, waterproof.

It pays to specify the name DIETZGEN

EUGENE DIETZGEN CO.

Right goods at right prices
continuously since Year 1885

Branches
Chicago New York
New Orleans Pittsburgh
San Francisco

Philadelphia Washington
Milwaukee
Factory
Chicago, Illinois

PERSONAL NEWS

Mrs. Clara T. Connely has been appointed as director of domestic Science at Carrollton, Mo.

Mr. Albert J. Jameson has been reelected as head of the Boys' Trade School, and Miss Elizabeth W. Burbank of the Girls' Trade School at Worcester, Mass.

Ray F. Kuns, principal of the Automotive Trade School and **B. H. Himmelmann** of the Printing Trade School, both of Cincinnati, Ohio, have been raised to par with elementary school principals in the matter of automatic salary raises.

TO MEET IN CHICAGO

The Vocational Education Association of the Middle West will hold its 1925 convention in Chicago, at the Hotel Sherman, February 12-14.

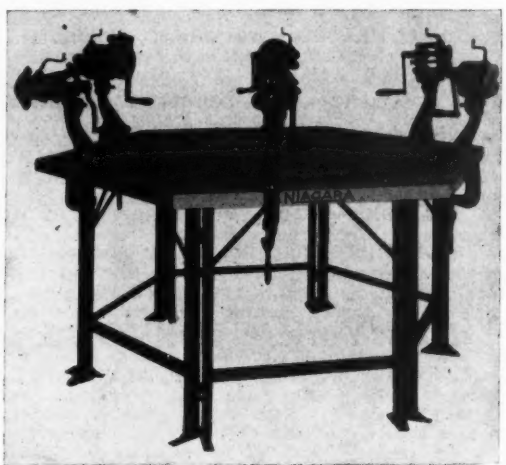
NEW PRODUCTS

The Niagara Hexo-Bench. The Niagara Machine and Tool Works, Buffalo, N. Y., manufacturers of machines and tools for sheet metal work, have placed on the market a bench for the sheet metal shop.

The bench, which is particularly adapted for use in the school shop, has six sides, affording a maximum working space combined with a minimum floor space. It is designed for holding commonly-used bench machines such as the turner, the wiring machine, and burring machine. The Hexo-bench facilitates materially the supervision of the class and the demonstration of problems.

The bench is about five feet across the flats requiring the use of a minimum of floor space and at the same time, giving room for the operator to lay out the problem upon which he is working, and keeping the floor of the shop clean. An angle iron brace near the bottom of the legs may be used for supporting a lower shelf. It is supplied with bolts and screws and may be installed by the students.

Circulars describing the new Niagara bench may be obtained by addressing the Niagara Machine and Tool Works at Buffalo.



HEXO BENCH WITH SIX MACHINES IN PLACE.

A New Combination Woodworker. The average manual training shop, especially in the smaller school, cannot afford a complete equipment of woodworking machinery. The shop may be able to afford a saw table but it is rarely possible to have a jointer or a planer. In many cases these machines are not actual necessities, because they can be used only a compartively short time during the school year. For the average manual training shop a combination woodworking machine solves the problem of affording ample mechanical equipment to undertake any ordinary work at a minimum cost and at a minimum space requirement.

An ideal machine for this purpose is the new Simplicity Woodworker manufactured by the Combination Woodwork-

(Continued on Page 27a)

STANLEY

STANLEY S.W.

"Everlasting" Chisels

Head, Shank and Blade are forged from one piece of tool steel. Insures great strength and durability. Provides maximum of efficiency, as a blow on the head is transmitted directly to cutting edge.

Leather washer between handle and steel head serves as cushion, thereby relieving handle from shock. Handle of selected hickory, fitting snugly into ferrule.

STANLEY
NEW BRITAIN, CONN. U.S.A.
THE STANLEY WORKS — THE STANLEY RULE & LEVEL PLANT

(Continued from Page 24a)

ing Machine Company, 40 South Clinton Street, Chicago. The Simplicity Woodworker is primarily a saw table of the universal adjustable type and is ample for all general school shop purposes. It is equipped with a complete jointer table, planer, boring table, and a speed spindle. If desired, the machine can be fitted with special attachments for upright shaper work and turning.

SIMPLICITY COMBINATION WOODWORKER.

The machine has been on the market a sufficient length of time to prove itself entirely practical and most economical under widely varying commercial uses. In addition to the ordinary uses, it has been found especially helpful in cutting mouldings, rabbeting, cutting tenons, sanding, making raised panels, and cutting lock corners.

Complete descriptive circulars have been prepared and will be sent to school authorities on request.

Shop calculations made easy

by the use of

K & E Slide Rules

ALL manner of calculations,—simple as well as complicated problems, are solved rapidly by this *shortcut-method of calculation.* It will be found useful in the solution of problems involving such factors as

Revolutions per minute
Diameter and area of circles
Diameter of Pulleys and Teeth of Wheels
Weights and Gauge Points of Metal
Board Measure, Etc.

Easily taught by our self-instructing manuals and with the aid of our large-size Demonstration Slide Rule for class use.

Instructors are invited to send for complete information.

KEUFFEL & ESSER CO.

NEW YORK, 127 Fulton Street, General Office and Factories, HOBOKEN, N. J.

CHICAGO 818-20 S. Dearborn St. | ST. LOUIS 917 Locust St. | SAN FRANCISCO 30-34 Second St. | MONTREAL 5 Notre Dame St. W.

Drawing Materials, Mathematical and Surveying Instruments, Measuring Tapes

WHEN SCHOOL BEGINS—

every ambitious child will look forward eagerly to his new work. His progress will depend largely on his love of school. To quicken that love, are you, as an educator, presenting in their most attractive form the subjects he will study?

Color, as you know, plays an important part in arousing attention and holding interest. And, in your seat work problems, a generous supply of Gold Medal Products, such as "Crayola" Wax and "Perma" Pressed Crayons, "Artista" Water Colors, and Lecturers' Colored Chalks will help wonderfully. They revitalize old subject matter—let us tell you how.

Put your class-room problems up to our Art Service Bureau—it is YOUR Art Service Bureau.

Binney & Smith Co.

41 East 42nd Street. New York

WICKES
BLUE PRINT SYSTEM

The Vocational and Manual Training Department in your school is not complete without a blueprinting Machine.

Bring your department up-to-date by installing a WICKES CONTINUOUS ELECTRIC blueprinting machine before the school year starts.

Our machine is of compact construction, occupying a minimum floor space, simple to operate, practically fool-proof, and very economical in the use of current consumption.

Let us ship you a machine on 30 days' free trial.

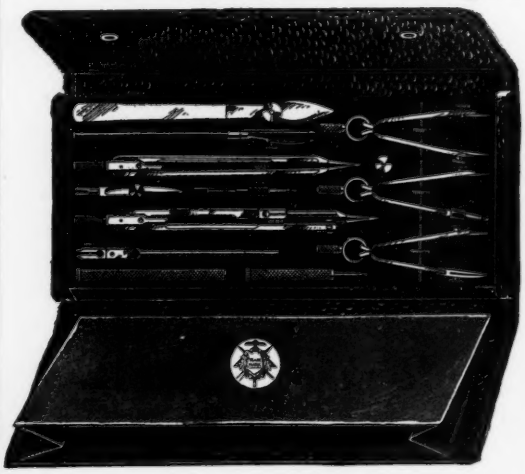
Write for catalog "AA" giving full details.

1856 **WICKES BROTHERS** 1924

Saginaw, Mich.

501 Fifth Ave., New York **736 White-Henry Bldg., Seattle**

Drafting Material *for* Schools and Colleges



General agents for the Genuine World Famous Richter Instruments. Beware of imitations. The genuine Richter Instruments have no equal.

Write for our Prices and Catalog

U. S. BLUE CO.

201-207 So. Wabash Ave., CHICAGO, ILL.

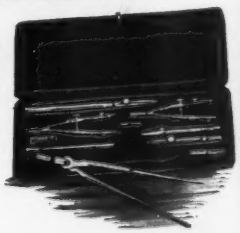
Built as Draftsmen Want Them Built

If you had time to personally visit a factory that manufactured drawing materials and could follow each instrument through that factory, overseeing and directing every operation from the designing to the finished article, you would know that the products would exactly fit your particular requirements. The same degree of confidence that comes from personal supervision is felt by draftsmen everywhere toward Weber Cataloged Drawing Materials. They make it a habit to look through the Weber Catalog whenever they need any drawing materials. You, too, will find this a far more satisfactory method than haphazard shopping around. If you have not already a copy of the Weber catalog, write to Dept. IA.

F. Weber Co.,

1220 Buttonwood Street, Philadelphia

St. Louis Baltimore

Drawing Instruments on Page 196 of your catalog.

WEBER *Cataloged* Drawing Materials